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QUEENSLAND AGRICULTURAL JOURNAL

In the Mulga Country, South-western Queensland.

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Edited by
C. W. WINDERS, B.Sc.Agr.

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Sorghum Growing in Queensland.

L. G. MILES, Senior Plant Breeder, Agriculture Branch.

(*Continued from page 213 of October issue.*)

SWEET SORGHUMS.

General and Historical.

IT is essential to realise that there is no hard and fast difference between the grain sorghum and the sweet sorghum types. Both arose from the same original sources, and their representatives will inter-cross freely, with no evidence of sterility. Recognised grain sorghums may have sweet juicy stalks and leaves, and conversely many of the well-known sweet sorghums are capable of producing high yields of grain. It is purely an arbitrary classification, therefore, which distinguishes the sweet or fodder sorghums from the grain sorghums by their greater height, more juicy stalks and leaves, and the higher sugar content of the juice. The main considerations for a good fodder crop are a high bulk per acre, and high quality and palatability of that bulk. These requirements are best satisfied within the sorghum group by the tall, vigorous, leafy varieties which are commonly known as sweet or saccharine sorghums.

Most of the sweet sorghums commonly cultivated today are derived directly or indirectly from a collection made in Natal during the middle of the nineteenth century by an Englishman named Leonard Wray. The varieties in this collection were planted out in Europe, without great success, and in 1857 they were taken to America for trial in the southern United States. Here they met with rapid success, providing both fodder for farm animals and syrup or "sweetening" for use in the farm kitchen in place of cane sugar. Many of these original strains have proved so suitable for the purposes for which they were required that there has been relatively little breeding work carried out in the improvement of this crop. One minor objection to the majority of these varieties (the brown-seeded types) is that the seed is somewhat bitter and unpalatable owing to its tannin content. Though this objection has not been regarded very seriously in most sorghum-growing countries, some steps have been

taken by hybridisation to alter the grain colour to white (as in Atlas) and thus eliminate the tannin content. A more important shortcoming in some varieties (for example, Jones, Sumac and Dwarf Ashburn) is the ease with which their stems lodge or tangle under certain conditions. Some attention has therefore been devoted also to the selection of varieties with strong stalks, such as White African and Atlas, the use of which greatly simplifies the problems of harvesting.

Sweet sorghums have been introduced into Australia, largely from the United States, at many times in the past, and are now a long

Plate 94.

A Sweet Sorghum Crop Suitable for Silage.

established standard crop on Queensland dairy farms. Such crops are grown principally for green feed, and to a lesser extent for ensilage or for direct grazing by stock.

Analyses have shown that the nutritive ratio of the sweet sorghums is wider than that of green maize—that is, there is a lower ratio of digestible protein to carbohydrates and fats in the former than in the latter. Green sorghum, therefore, though much relished by all kinds of stock, is not as well balanced a diet as is green maize, and should be fed in conjunction with a protein concentrate or a protein-rich hay if best value is to be obtained from its use. Another disadvantage of sweet sorghum in comparison with maize as fodder is the risk of poisoning with the former if used prior to the heading stage; maize can be fed with safety at any stage of growth. Sweet sorghums, however, have the important advantage that, while under favourable conditions of rainfall and soil they can produce crops at least as heavy as maize, under less favourable conditions they may be far more productive than maize. They also preserve their succulence for a longer period than does maize after the onset of winter.

Planting and Cultivation.

Preparation of the soil follows the same course as for grain sorghums, since the same requirements must be met in providing for a good strike of plants and good early growth and development. A fine moist seed-bed may at times be even more important with this crop than with grain sorghums, because of (1) the generally smaller seed size, and (2) the manner in which the seed of certain varieties is tightly held within the hulls.

Sowing is carried out by means of the maize planter, by the combine drill, or by broadcasting. The method of planting and the distance apart of the rows will depend largely upon the intended use of the crop and the harvesting procedure to be adopted. Where the crop is to be hand-cut or harvested with the maize-binder, planting in rows 3 ft. or 3 ft. 6 in. apart at a rate of 3 to 5 lb. of seed per acre is recommended. This can be accomplished by means of either the maize planter (with sorghum plates) or the seed drill with the appropriate runs blocked. Planting at these row spacings makes for tall stout stalks which are better able to resist wind damage than the finer stalks produced by heavier seeding. Row-planted crops will require inter-row cultivation for the control of weeds and maintenance of a surface mulch. Such cultivation will normally cease when the plants have attained a height of about 4 ft. and have begun to provide an effective cover of the inter-row spaces.

Where the crop is required for grazing or for mowing, it is essential that the stems be finer and softer than those produced under the above conditions. This is accomplished by broadcasting the seed or by drilling it in at a 7-inch or 14-inch row spacing; average seeding rates would be 12 to 15 lb. per acre for broadcasting or 7-inch row spacing, and 7 or 8 lb. per acre for 14-inch row spacing. Broadcasting is normally followed by a light harrowing to cover the seed, and sometimes rolling also is required to ensure that the seed makes contact with good moisture. Drilling, of course, is usually a far more efficient means of seeding the crop than is broadcasting. No further cultivation is usually given to close-planted crops except perhaps a harrowing when the crop is well rooted and about 6 inches in height.

Harvesting and Utilisation of the Crop.

Efficient utilisation of a bulky crop such as sweet sorghum demands that it be cut and chopped up before going to the feed-box or silo. When there is no power equipment available for harvesting, the crop must be cut with a cane-knife and passed through a chaff-cutter to prepare it for box or trough feeding. When used for green feed the crop is normally harvested in daily sections, and the day's cut transported from the field on a slide or wagon. Where stall-feeding is not practised, the stalks may be thrown whole into the night paddock of dairy cows or into pig pens. Feeding by this means is more wasteful than feeding chopped material, but the wastage in feed may be compensated for by the saving in time due to elimination of further handling.

The ideal period at which to cut sweet sorghums for green feed is when the grain is at the milky stage. By this time maximum growth has practically been attained, and the plants are more succulent and less fibrous than at later periods. However, if the crop is fed over a considerable period by means of daily cutting, it is profitable to commence cutting at an earlier stage so that the average stage at

harvesting will approximate to that suggested. Staggered plantings, or the use of both early and late maturing varieties at the one planting period, may enable a crop to be utilised over a period of two or more months.

Many dairymen have ample grazing for their stock during the late summer and autumn, and therefore do not require sorghum fodder at the time at which this crop would normally be approaching maturity. They prefer, therefore, to let their crops stand over into the winter to provide fodder when pastures have almost ceased production. This standing over of sweet sorghums involves a definite loss both in food value and in palatability, particularly after frosts have occurred. Leaf may be killed by frosting or spoiled by the bacterial red-spot or red-streak diseases which are commonly but incorrectly referred to as "rust." Drying out of the stems gradually takes place, and changes occur in the sap, often resulting in fermentation and souring. Certain varieties have, however, definitely shown their ability to hold their sweetness and palatability well into the winter. The growing of such varieties for late harvesting may therefore have much to justify it in spite of the losses which inevitably occur upon standing.

When sweet sorghum is planted for the provision of a silage crop, it should normally be planted at mid-season so as to enhance its prospects of producing the maximum bulk of leafy and juicy material. It is preferably harvested when the grain has reached the dough stage, as by this time the maximum green weight has normally been attained. Crops for silage are sometimes cut by hand and carted in for chopping prior to charging the silo; this method is, however, slow, and expensive of human labour. Harvesting is greatly accelerated if a maize-binder is used in place of the cane-knife, but considerable labour is still required to transport the material to the silos. It would appear that the ideal method of ensiling sorghum material to-day is by means

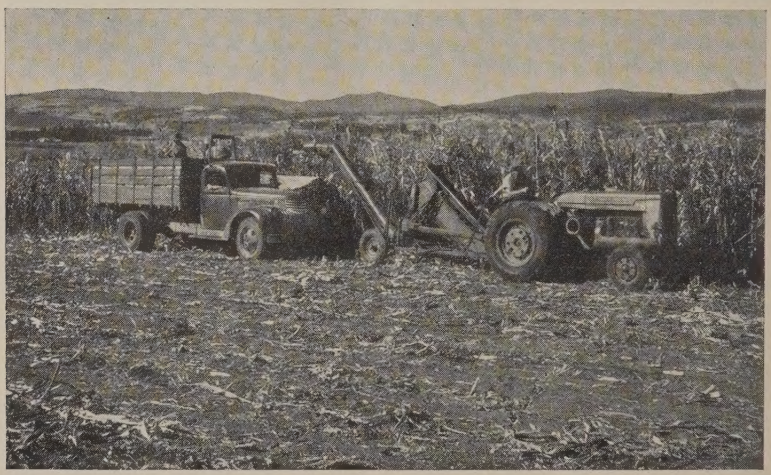


Plate 95.

ENSILAGE HARVESTER HANDLING A CROP OF MAIZE AND DELIVERING THE CHAFFED MATERIAL INTO A MOVING TRUCK.—Sweet sorghums are harvested in identical manner by such machines.

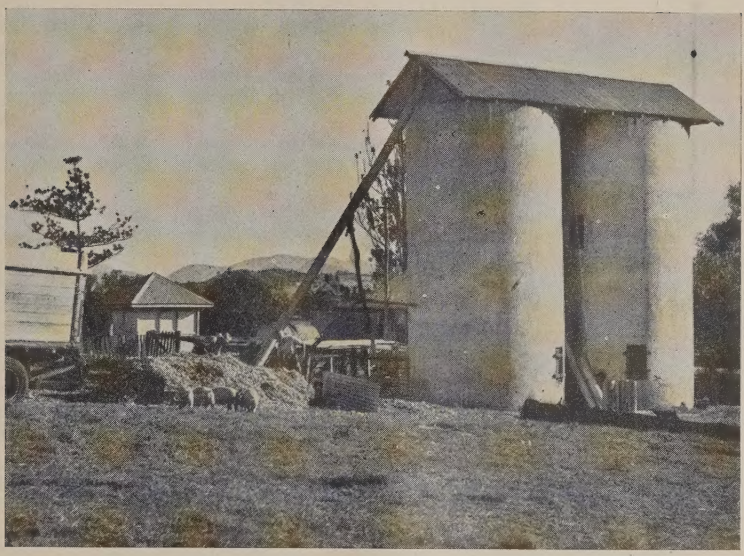


Plate 96.

CHOPPED ENSILAGE BROUGHT BY TRUCK DIRECT FROM THE FIELD BEING FED INTO A BLOWER FOR THE FILLING OF TOWER SILOS.

of the new combine ensilage harvesters. These machines continuously cut and chop the standing crop, blowing the chaffed material into a trailer which accompanies the machine round the field (Plate 95). When one trailer is filled, it is immediately driven off to the silo (Plate 96), and an empty trailer takes its place alongside the machine. By the use of such machines, manpower is reduced to a minimum in the handling process.

One other method of use of sweet sorghums is by direct grazing. This is not often practised in Queensland, as Sudan grass is generally regarded as a more suitable crop for the purpose. It is also much commoner to see grain sorghums grazed than sweet sorghums, as the former, though grown primarily as grain crops, are almost always planted with the dual purpose usage in view. When sweet sorghums are fed off during early growth, much useful grazing may result, but precautions must be taken to avoid the risk of sorghum poisoning. Where stock are given direct access to a crop which has passed the heading stage, much wastage normally occurs. Such wastage may, however, be reduced to a minimum if the crop is subdivided into small areas which are individually heavily grazed in turn.

Many of the taller, late-maturing varieties of sweet sorghum are capable of yields of more than 20 tons of green material per acre. Yields of 15 to 20 tons per acre have frequently been recorded with 3 ft. 6 in. row spacings, even in drier districts such as the Callide Valley. On poorer soils, or in seasons of insufficient rainfall, yields of 10 to 15 tons per acre will be closer to expectation.

Harvesting for Seed.

The bulk harvesting of sweet sorghums for seed is often a difficult process on account of the height attained by these plants. Crops which are required for seed may be allowed to mature their grain in the field, or in the stook if hand-cut or harvested by the maize binder. Grain from such stalks or sheaves can be readily threshed in stationary threshers, and the residue set by for stock food. Since stationary threshers of the required type are rare in Queensland, however, it is to the header-harvester that most farmers look for the harvesting and threshing of their seed. Seed of many varieties has been satisfactorily handled by this means, particularly in the drier districts, where plant heights may not exceed six or seven feet. One or two rollers are used above the comb to push the stalks forward and bring the heads down to a more suitable level for cutting. Even so, the process is often slow, and stoppages may be frequent. Some farmers have provided their own adaptations to standard headers for grain harvesting from tall crops. One such modification which has proved successful is the replacement of the existing comb with a high comb which cuts the heads at an appropriate level and passes them down a shoot to the elevator in front of the threshing drum. It would appear that farmers specialising in the production of sweet sorghum seed would require either some such modification to an existing machine or a specially designed header with a comb which is capable of being racked up to six feet or more.

Varieties.

Sweet sorghum varieties have been in a state of considerable confusion for many years, due partly to the inter-varietal hybridisation which has frequently occurred and partly to the loose use of varietal names. Some of the older varietal names, such as Imphee, or more recently Saccaline, have come to be identified by farmers with sweet sorghums in general, just as Milo has frequently been loosely used as a general term for grain sorghums. The only remedy for this confused state of affairs is for farmers and seedsmen to take some trouble in learning to recognise the better varieties, and to insist on the maintenance of high standards of purity within them.

Among the earlier introductions during the last century were a range of types which have been widely spread throughout our farming districts and are well known under such names as Imphee, Planter's Friend, Saccharatum, Early Amber and Black Amber. In Queensland, most of these varieties have given way to Saccaline, and those that remain are often badly contaminated and loosely named. In recent work, Saccaline has been adopted as the standard or check variety against which anything new must be tested. The detailed descriptions following deal therefore with Saccaline and with a number of other varieties of equal or greater merit, of which pure seed stocks are being maintained within the State.

Saccaline (Plate 97).

Saccaline is a tall, late-maturing variety which has proved itself capable of heavy fodder yields under a wide range of conditions in Queensland. Over a number of years its height has varied from 8 feet to 11 feet, though considerable reduction in height (coupled with failure to head) may result from conditions of drought or very low soil fertility. Heading occurs within 2 to 3 months, and grain ripens on the primary stalks in 3 to 4 months. Foliage is abundant, but fires

Plate 97.
HEADS OF SWEET SORGHUM VARIETIES.—Saccaline on left; Sugardrip on right.

rather early under dry conditions, and the crop presents a somewhat stemmy appearance compared with Sugardrip or White African. Stems and leaves are juicy and sweet. Saccaline tillers very freely producing up to five or six stalks per plant. Stem branching may be

absent in some seasons, but fairly marked at other times. Heads are irregularly cylindrical, though they may become small and oval under droughty conditions; properly developed heads are normally fairly open in texture, with the lower branches tending to spread a little. Awns are absent. Glumes are small and black, usually with few hairs remaining at maturity. The grain is small, but projects quite prominently from the glumes; it is distinctly elliptical in shape (as contrasted with the more rounded shape of the grain sorghums), and is a rather dark reddish brown in colour (normally lighter than Sumac, but darker than Sugardrip). Saccaline is capable of green yields of 20 to 30 tons per acre, and is widely adapted in Queensland. It suffers by comparison with some of the following varieties in its greater tendency to lodge (particularly following strong winds), and in its greater susceptibility to the bacterial red spot which may badly disfigure the leaves and stems.

Sugardrip (Plate 97).

Sugardrip is another vigorous, brown-seeded, late maturing variety which superficially bears a very close resemblance to Saccaline. Its height ranges from 8 feet to over 10 feet, except in stunted crops. Full heading stage occurs in from 2½ to 3 months, and the primary tillers mature their grain in 3½ to 4 months; grown alongside Saccaline in Central Queensland over a period of years, it has averaged approximately a week later in its maturity. Its foliage is good to very good, being usually more abundant than that of Saccaline, and both stems and leaves are juicy and very sweet. Sugardrip tillers freely, like Saccaline, but has proved much less inclined to develop stem-branches. Heads are approximately 10 inches by 2½ inches, irregularly cylindrical in shape, and of medium density. Awns are absent, and the glumes are black and almost hairless. The grain is small, brown, and well exserted from the glumes; in shape it is rounded on top and pointed at the base, rather than elliptical as in Saccaline. The grain can normally be distinguished from that of Saccaline by this slight difference in shape and the generally lighter shade of colour. This variety has made an excellent impression in Queensland, being capable of yields equal to those of Saccaline and often providing more attractive fodder. The variety stands well under all but excessively windy conditions, and is less prone to red spot than Saccaline, Sumac, Honey and a number of other varieties. It is capable of retaining its sweetness following frosting, and has on one occasion in the Lockyer Valley provided sweet juicy stalks in August, eight months after planting. It is recommended for use for either fodder or ensilage throughout the agricultural districts of Queensland.

White African.

This is a variety which is by no means new to Australian agriculture, but which has never been widely grown in Queensland in spite of its undoubted yielding ability. It is tall, ranging from 8 feet to 11 feet under medium to good conditions of growth, and has the same growing period as Sugardrip. Its foliage is normally quite abundant, but the leaves are widely spaced on the stems. The juice is quite sweet, as in other varieties of sweet sorghum, but this juice is not as abundant as in some varieties, particularly as maturity is approached. The variety stools moderately freely; but tends to have fewer and stouter stalks than the preceding varieties. Heads of this variety

Plate 98.

HEADS OF SWEET SORGHUM VARIETIES.—Italian on left; Atlas on right.

are oval rather than cylindrical and are more open and spreading than in any of the other varieties, except Honey. Awns are absent, and the black glumes hold the grain tightly, covering it almost to the tip. The grain is medium-small, distinctly elongated (elliptical) in shape and a clear enamel white in colour. Its head shape and grain colour distinguish this variety clearly from other known varieties of sweet sorghum. The variety is very sturdy and erect, being able to resist lodging under very windy conditions; this is an important factor, particularly where mechanical harvesting is practised. White African is also fairly resistant to red spot, its leaves and stems being frequently without blemish when Saccaline is quite severely blotched. It carries quite well into the winter, but is less juicy throughout than most of the other varieties. This should be a useful silage variety, particularly for mechanical harvesting, but should be handled before it becomes over-mature.

Atlas (Plate 98).

Atlas is another white-seeded sweet sorghum, which is readily distinguishable from White African, however, on the basis of its seed-head characters. Its height normally ranges from 7 feet to 10 feet, being up to a foot shorter than Saccaline under comparable conditions. It heads in from 2 to 3 months and matures in 3½ to 4 months. Stems are stout, strong and erect, and yet of very satisfactory sugar content; foliage is present in good proportion to the stems, and both stems and leaves are very free from red spot. Tillering is quite free, providing well stooled plants, and stem-branching ranges from nil to very heavy. Heads are very similar to those of Blackhull Kafir, and not unlike those of the well known grain variety Hegari. Their size is approximately 9 inches by 2½ inches, and they are typically of medium density or somewhat denser. Awns are completely absent. Glumes are black and somewhat hairy, and allow of considerable exposure of the grains. The latter are medium-small to medium in size, rounded to slightly elliptical in shape, and creamy white in colour with occasional reddish brown spots or blotches. This variety, like White African, has proved very sturdy and free from lodging, but under Queensland conditions appears to be juicier and very palatable to stock. In yield tests it has not proved quite so productive as Sugardrip, White African and Saccaline, but is capable of producing quite a useful re-growth after the initial cutting. Like Sugardrip and Italian, it has shown its ability to hold over well into the winter without serious fermentation or loss of sweetness. It has also shown itself widely adapted to Queensland conditions, and should be ideal for mechanical harvesting.

Italian (Plate 98).

Italian is another brown-seeded sorghum of the Saccaline-Sumac group but appreciably earlier in its maturity than any which have been previously described. Under average conditions its height is from 6 feet to 9 feet. It requires 8 to 11 weeks to come into full head, and may mature its early grain in under 3 months, but more usually about 3½ months are required. Foliage is ample under good conditions, though inclined to be sparse in a short, dry season. The variety tillers moderately well, and branches very freely under the stimulus of late rains. Primary heads may be medium-large (approximately 9 inches by 2½ inches), elliptical in shape and usually slightly open in texture; the secondary heads arising from stem-branches are usually much smaller, slenderer, and more tight. Awns are absent and the glumes

Plate 99.
HEAD OF HONEY SWEET SORGHUM.

are small and reddish brown to dark straw in colour. Grains are definitely small, elliptical in shape and are well exposed on top; they are typically a medium brown. This variety is very juicy and sweet, and in spite of its earliness has shown its ability to carry over well into the winter. Under most conditions it will not yield as heavily as the later-maturing varieties, but the palatability of its fodder plus its ability to stand after maturity make it a favourite with nearly all farmers who have tried it. Italian is a better variety for close planting than the taller, coarser varieties.

Honey (Plate 99).

This is probably the most individual of all the varieties in this group, particularly in its appearance during the heading period. It is a fairly tall variety (7 feet to 9 feet), and one of the latest of all in its maturity. Stems are normally very stout and the foliage is heavy and broad. Plants are both juicy and sweet, but under rank growing conditions may be less sweet than Sugardrip or Italian. The variety tillers quite freely, making a very heavy bulk under favourable conditions. Stem-branching may be absent or quite free, according to the season. The head or panicle is extremely open, with long, drooping branches like those of broom millet; examples may exceed 15 inches by 8 inches in dimensions. This is the only common sweet sorghum in which awns are present, and even these are largely deciduous at maturity. Glumes are an attractive shiny reddish brown with few hairs, and they totally enclose the small seed. The seed when freed from its glumes is rather long, elliptical, and flattish, and is a buff to medium brown in colour. As, however, the glumes or hulls usually remain attached to the seed, they serve to distinguish it very easily from that of any other variety. Honey is capable of very heavy yields under favourable conditions, but is less productive than a number of other varieties in the drier districts. It has for many years been favoured for green feed in coastal districts, where it frequently outyields other varieties, and has also given good yields on the Atherton Tableland and in North Queensland generally. Honey is not recommended for standing over into winter because, (1) it may be very subject to red spot, and (2) it may become very coarse and woody as maturity is reached.

Other Varieties.

Queensland farmers are not likely to encounter many true varieties other than those described above. One group, however, which is well known throughout the world is the Sumac group. Sumac is a tall-growing, leafy variety not unlike Saccaline in its habit and period of maturity. It is easily distinguished by its compact heads well filled with small grain of a dark brownish red colour. This variety is quite succulent and sweet, but is very subject to red spot, and also lodges badly.

Early Sumac is an early-maturing selection from Sumac, which is shorter than the parent variety; its seed heads and seed are very similar to those of Sumac. If sown at closer spacings this variety should prove the most suitable for mowing, or harvesting with the reaper and binder. It also produces a useful re-growth after cutting.

Dwarf Ashburn is a midseason variety, which is also very productive and very palatable. It is closely allied to the Sumacs and is intermediate in season between Early Sumac and Sumac.

Jones is a tall variety with fairly stout stems, which is capable of high yields of attractive feed. It is very subject, however, to stem lodging, and this twisting and bending of the stems makes harvesting very difficult.

Many other varieties, including members of the Orange group, Colman and Leoti, have been tested in Queensland, but cannot be recommended for local use.

SUDAN GRASS.

Description.

Sudan grass is a native of tropical North Africa, which is now extensively used as a grazing and hay crop in most of the subtropical regions of the world. In Queensland it has become one of the most popular summer grazing crops for the sub-coastal and inland districts.

Sudan is a tufted grass which stools very freely, and may reach a height of 6 to 10 feet when in head. Stems and foliage are very fine in comparison with those of grain or sweet sorghums. While in widely spaced rows the stems may reach a diameter of $\frac{1}{4}$ inch, under normal conditions of heavy stand they seldom exceed $\frac{1}{8}$ inch. Leaves are abundant, ranging in length up to about 2 feet, and averaging $\frac{1}{2}$ inch to $\frac{3}{4}$ inch in width. The root system of Sudan grass is completely fibrous, with no development of the long white underground rootstocks which characterise the closely related Johnson grass. Sudan grass heads within 6 to 9 weeks of sowing, and the head is a widely branched open panicle which is typically conical in shape. The seeds are small in comparison with any of the sorghum varieties and are normally retained within the glumes or hulls. The small kernels are markedly elongated and are inclined to be pointed at both ends.

Sudan grass is frequently regarded as a biennial and has even been known to persist into a third season. It is normally treated in Queensland, however, as an annual summer crop, because stands are liable to be thin, weedy, and relatively unproductive during the second season. Its use is largely restricted to areas of medium or low rainfall, as under wet conditions the prevalence of "rust" and red-spot diseases may largely ruin the crop for either grazing or hay.

Planting and Cultivation.

The necessity for the use of seed of known origin and of a high standard of quality has already been emphasised. Johnson grass is one of our most serious pests of cultivation, and as its seed is very similar to that of Sudan grass the risk of introducing it in Sudan grass seed must never be overlooked. Moreover, hybrids of Sudan grass with Johnson grass or sorghums are regarded as being far more likely to develop poisonous properties than is pure Sudan grass. The planting seed should therefore have been harvested from a pure crop of Sudan grass which was separated by half a mile or more from the nearest plants of grain sorghum, sweet sorghum or any other grass sorghum.

Seed is usually planted in Queensland on a well prepared seed-bed, using the combine or seed drill. With this crop it is recommended that every grain run be used, as such block-sowing promotes finer stemmed plants which are more readily eaten by stock and are better suited for haymaking. Planted by this means, 8 lb. of sound seed per acre will give a very satisfactory stand, but planting rates of 10 to 12 lb. per acre are

more common. Where the seed is broadcast, somewhat higher rates may be advisable, but it should not be necessary to exceed 15 lb. per acre. Where Sudan grass is grown for pure seed production it is suggested that a row spacing of 21 inches or 28 inches be used, to allow of inspection of the crop and roguing where necessary.

Where the crop is block-sown or broadcast, there is no scope for further cultivation except possibly for a harrowing of the young crop, which procedure has frequently been found beneficial. Where a crop has been grazed to the ground or cut for hay during the midsummer period, a further harrowing of the stubble to loosen and aerate the soil will improve the prospects of a useful ratoon crop.

Utilisation of the Crop.

The great bulk of the Sudan grass grown in Queensland is intended for grazing by dairy cattle. The crop is also grazed by beef cattle and sheep, but to a lesser extent than by dairy stock. The crop is also used for haymaking and occasionally for ensilage.

Although the dictum that crops are not safe for feeding until they have reached the heading stage applies equally to Sudan grass as to other sorghums, it is very little heeded by most growers. Dairymen habitually graze their cows on Sudan grass at all stages of growth, and particularly during the early stages when the feed is most succulent and nutritious. The risk of stock losses following this procedure has been shown in Queensland and many other countries to be remote, provided (1) pure seed of a known reliable strain of Sudan grass is used, and (2) reasonable precautions are taken. Precautionary measures have already been suggested in the section on poisonous properties of sorghums. The grass makes rapid recovery after grazing, and several grazings may be obtained during a favourable growing period.

When harvesting for hay or ensilage, the crop should be cut at the flowering stage before the plants have become dry and fibrous. The operation is most efficiently carried out by means of the reaper and binder. When cutting for hay, the bundles should be made small, as bulky sheaves require a long drying period and are difficult to cure satisfactorily in the field. Sudan grass hay is of very fair quality, particularly if cut at the optimum time and before leaf blemishes have become prevalent. The quality of Sudan grass silage is also very satisfactory, and these two methods of conservation are strongly recommended in the drier agricultural districts of the State. Two to three cuttings may be expected during a reasonable season. Where a better balanced forage or hay is required, the crop should be sown with a fairly early maturing legume, such as Groit or Victor cowpea, broadcast at the rate of 4 to 5 lb. per acre.

Under good growing conditions yields of green feed up to 12 tons per acre are readily attainable on the first cut, but yields of 8 to 10 tons would be far more common. Hay yields of 2 to 3 tons per acre for the main cutting should result from good average crops in the inland dairying districts.

Harvesting for seed is carried out by means of the header-harvester after the grain has thoroughly matured within its hulls. Crop lifters may be required if lodging is at all serious in the mature crop, and the fan blast should be reduced, if necessary, because of the

relative lightness of the seed. Seed yields are light compared with those of the other sorghum groups; yields of 10 to 12 bushels per acre would be regarded as satisfactory under most conditions, but yields of 20 to 25 bushels per acre have at times been realised.

Varieties.

While varieties of Sudan grass have not been generally recognised in the past, definite differences between types have been known to exist, and steps are now being taken to establish varietal types (Plate 100). The first of these named varieties, Roma, has been in production in Queensland for a number of years. The second, Sweet Sudan, is a recent importation which has not yet been thoroughly tested but which promises to play a useful role in this State,

Plate 100.

Sudan Grass Rows in Sorghum Breeding Plot, Kingaroy.—Sweet Sudan grass on left; Roma Sudan Grass on right. Sweet sorghum rows are on each side, and grain sorghum in foreground.

Roma.

Roma is a productive, tall-growing Sudan grass which stools very freely and provides good grazing. Although no sweeping claims can be made with respect to its freedom from poisonous properties, it is recorded that crops of this strain have been grown for many years in southern Queensland and grazed at all stages of growth with no known cases of stock loss. Chemical tests made at weekly intervals on a small planting in the Brisbane district during the summer of 1948-49 showed that the prussic acid content was negligible during the whole period of the test. Heads are large and very spreading, and are prominently awned or bearded. The hulls, which completely enclose the grain, are shiny and straw-coloured; occasionally they may be blotched or partly coloured with brown, but it is the predominantly light colour of the hulls which distinguishes this variety from most other seed lots. The kernel when stripped of its hulls is long and narrow, tapering to a blunt point at both ends; its colour is medium to dark brown. This variety has been included within the Department's seed certification scheme, and its spread throughout Queensland should be of considerable benefit to all farmers who use this crop.

Sweet.

This variety was developed in the United States from a cross between a standard Sudan grass strain and a sweet sorghum, Leoti. The object of the cross was to produce a plant similar to Sudan grass in its growth and general habit, but possessing also a sweet sap and carrying resistance to the bacterial red spot diseases. The resulting selection is unmistakably a Sudan grass in its appearance, but is less tall than Roma when grown under similar conditions. The plants stool very heavily and produce an abundance of leaf; these factors, coupled with its sweetness and high palatability, should make it a very attractive fodder or grazing plant. Sweet Sudan has somewhat smaller heads than Roma, the branches being shorter and less widely spaced. Awns are present, though relatively short, and the glumes or hulls are a glossy reddish brown in colour. The kernels are distinctly larger than those of Roma, due mainly to their greater broadness and plumpness in relation to their length, and are lighter in colour. This variety is readily identified from other varieties of Sudan grass by the size of its kernels and the distinctive colour of its hulls. Considerable claims have been made for this new variety in the country of its origin. In Queensland it has so far been subjected merely to exploratory trials, and in such trials its appearance has been quite promising. When tested for prussic acid content during the 1948-49 summer, it proved slightly higher throughout than Roma, though at no stage was it at all dangerous for feeding. A small trial in the Brisbane area also showed that it may not ratoon as well as Roma, particularly in the colder weather. If this variety does prove itself a safe and suitable crop for Queensland conditions, it will be rapidly multiplied and made available to farmers.

PESTS AND DISEASES.

Grain sorghum is liable to be attacked by a number of insect pests, some of which may very seriously affect yields. Some of these are pests of other agricultural plants also. The insects that may damage the growing crop include sorghum midge, corn ear worm, yellow peach moth, locusts and grasshoppers, and the grain aphid; while a grain moth and rice weevil may infest the harvested grain and cause serious losses in storage.

By far the most important of the several pests is the sorghum midge, which attacks the crop only at the flowering stage. Injury is caused to the developing grain and damaged heads are wholly or partially sterile, resulting in a correspondingly reduced grain production. Broom millet, Sudan grass, sweet sorghums and Johnson grass are similarly attacked. Crops which produce heads before midge populations become high in late summer and autumn suffer little damage. Economic control of the sorghum midge cannot yet be obtained with insecticides, and losses can be reduced only by correct cropping practices and by clearing up crop residues. Among other things, plantings should be so arranged as to give early and uniform maturity of the crop.

Diseases of sorghum are not as serious as the insect pests but can cause considerable reduction in yield if simple precautions are neglected. The most common disease in grain sorghum is covered kernel smut. Spores of the fungus which causes this trouble are carried on the seed. Control is readily effected by treating the seed with one of the fungicidal dusts marketed for this purpose, and the treatment should be regularly used.

A number of leaf diseases of sorghum are widespread but seldom cause appreciable injury. Blight (caused by a fungus) and red spot (due to bacteria) can reduce the value of sweet sorghum in the moister areas. Varieties of sorghum show wide differences in susceptibility to these leaf spots, hence trouble can be avoided by the use of resistant strains.

These and other matters regarding pests and diseases of sorghum are dealt with more fully in leaflets which can be obtained from the Science Branch of the Department, officers of which have supplied these notes.

Tackling Erosion Problems.

An ever-increasing number of Queensland farmers were realising the importance and benefit of soil conservation, said the Minister for Agriculture and Stock (Honourable H. H. Collins) recently.

It was estimated that in a little over a year through Departmental help and guidance, 5,000 acres of valuable land had been saved by the adoption of soil conservation practices. Every farm treated had led to numerous requests from other district farmers for similar Departmental advice and assistance in the protection of their land. From the Kingaroy district, where 3,000 acres have been initially treated, applications for Departmental assistance to protect an additional 25,000 acres had been received.

Mr. Collins said that 20 soil conservation demonstration areas had been established in Queensland from the Darling Downs to the Atherton Tableland. Situated on private farms, they were used to show district farmers modern methods of soil conservation and how profitable production could be maintained when proper protection methods were practised. In addition, Departmental experts had advised hundreds of individual farmers on control measures most suitable for their particular farms.

Seed Inoculation of Legumes.

T. McKNIGHT, Pathologist, Science Branch.

OVER the last 10 or 11 years Queensland farmers have made increasing use of the service of the Science Branch of the Department of Agriculture and Stock in providing cultures of nitrogen-fixing bacteria for inoculating seeds of legumes (that is, plants of the pea family), such as lucerne, cowpeas, lupins, and field peas.

Plate 101.

ROOT NODULES formed by Nitrogen-fixing Bacteria on Poona Pea.

The importance of plants belonging to the legume family, apart from their cash value or the place they occupy in an agricultural programme, lies in the fact that they are able to obtain nitrogen from the air. They do this when the roots of the legume associate with nitrogen-fixing bacteria which form nodules on the root system (Plates 101 and 102.) Inside these nodules the bacteria obtain nitrogen from the air and pass it on to the plant, where it is utilized for growth. In this way, legume plants differ from all other plants grown by the farmer, which derive their nitrogen entirely from the soil. As the grower is well aware, the supply of nitrogen in the soil is frequently insufficient to produce the best possible plant growth. To make good this deficiency of nitrogen, legume plants fixing their own nitrogen may be grown instead of adding costly nitrogen fertilizers.

Varieties of Legume Bacteria.

The legume nitrogen-fixing bacteria are not all of the one type but may be divided into a number of varieties or species. Each of these species will form nodules on a certain group of legumes only and is unable to form nodules on plants outside its own specific group. For example, the lucerne species will form nodules and fix nitrogen on plants in the lucerne group only and will not form nodules on plants in the clover group or on plants in the cowpea, soybean, lupin, and other groups. The lupin bacteria will form nodules on lupins only. It is essential, therefore, to know just which legumes can be successfully inoculated with a particular culture of bacteria. The following classification of cultivated legumes shows the group relationships among the nitrogen-fixing bacteria.

CORRECTION.

The illustration on page 267 has been inadvertently printed upside down, so that the inoculated plant is now on the left.

Red clover	*Trifolium pratense*
White clover	*Trifolium repens*
Subterranean clover	*Trifolium subterraneum*
Berseem clover	*Trifolium alexandrinum*

Cowpea Group.

Poona pea, cowpea	*Vigna unguiculata*
Desmodiums	*Desmodium* spp.
Common or Japanese lespedeza	*Lespedeza striata*
Korean lespedeza	*Lespedeza stipulacea*
Perennial lespedeza	*Lespedeza cuneata*
Gambia pea	*Crotalaria goreensis*
Kudzu	*Pueraria thunbergiana*
Lima bean	*Phaseolus lunatus*
Peanut	*Arachis hypogaea*
Pigeon pea	*Cajanus indicus*
Velvet bean	*Stizolobium deeringianum*
Phasemy bean	*Phaseolus lathyroides*
Mauritius bean	*Stizolobium aterrimum*

Soybean Group.	
Soybean	*Glycine max*
Garden Bean Group.	
French and navy beans	*Phaseolus vulgaris*
Pea Group.	
Field pea	*Pisum arvense*
Garden pea	*Pisum sativum*
Common vetch	*Vicia sativa*
Broad bean	*Vicia faba*
Sweet pea	*Lathyrus odoratus*
Tangier pea	*Lathyrus tingitanus*
Lupin Group.	
New Zealand blue lupin	*Lupinus angustifolius*
Garden lupin	*Lupinus pubescens*

Even among the different species of nitrogen-fixing bacteria, "strains" exist which vary in their ability to benefit the plant (Plate 103). An endeavour is made by the Science Branch when providing

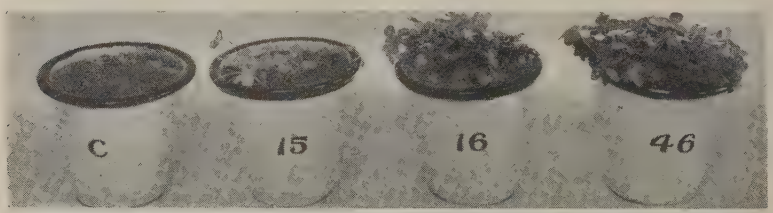


Plate 103.

Showing Variation in Efficiency of Strains of the Red Clover Nitrogen-fixing Bacteria. C, not inoculated; 15, inoculated with an inefficient strain; 16, inoculated with a strain of medium efficiency; 46, inoculated with a strain of high efficiency.

cultures of bacteria to growers to use only those strains which have been tested and found to fix nitrogen efficiently.

What to Expect from Seed Inoculation.

The value of seed inoculation is dependent on soil conditions, climatic conditions, cropping systems and fertilizing systems.

Given good moisture at the time of planting in soils that are low in nitrogen but satisfactory with regard to other plant foods, marked benefit generally follows the use of inoculated seed. Inoculation may mean the difference between success and failure of the crop on some of the poorer coastal soils where nitrogen is low and from which the appropriate strain of bacteria is absent. Such results, however, are the exception rather than the rule and more often smaller differences, of the order of 5 to 10 per cent., may be realized on a wide variety of soil types. The farmer should appreciate that such an increase in a field crop over a considerable acreage well repays the slight effort involved in inoculating the seed.

When the soil has been previously cropped successfully to the particular legume, or where the soil nitrogen supply is adequate due to fertilizing, cropping practices or natural fertility, the grower should

not look for improvement from seed inoculation. Growers are well aware that there are many hazards other than an inadequate nitrogen supply in the culture of legumes. The seed inoculation process is designed solely to ensure the presence of the beneficial nitrogen-fixing bacteria. Inoculating the seed will not ensure a successful crop, and under some soil conditions is no guarantee of the development of an adequate number of nodules. The grower can, on his own farm, determine fairly accurately the value of inoculating the seed by leaving a small but representative plot uninoculated for comparison purposes. If the plants in the uninoculated area grow equally well and have adequate root nodules, then inoculation is apparently unnecessary.

How to Obtain Cultures.

Farmers requiring cultures should write, indicating the variety of seed and the quantity to be treated, at least 10 days before sowing is anticipated, as that time is necessary for the preparation and despatch of cultures.

Cultures are issued in bottles of two sizes—large bottles to treat three bushels of seed; small bottles to treat one bushel of seed. With small seeds such as lucerne and clover the smaller bottle treats 30 lb. of seed and the larger 90 lb. A nominal charge of 1s. per bottle is made irrespective of size. It is desirable that remittances be forwarded with order. Small remittances should preferably be sent by postal note. All remittances should be crossed and made payable to "Under Secretary, Department of Agriculture and Stock." Orders for cultures should be sent to the Brisbane office of the Department.

The Culture.

The cultures are supplied in medicine bottles plugged with cotton wool. In the bottles the bacteria may be seen as an uneven whitish slime growing on the sloping surface of a jelly. Store the culture in a cool, dark place, and do not remove the cotton wool plug from the bottle until the culture is to be used. The culture may be used at any time up to six weeks after date of receipt. During transit in the post the jelly may be broken into pieces but this has no harmful effect on the bacteria.

Directions for Inoculating the Seed.

The inoculation process is simple, consisting merely of wetting the seeds with a suspension of the bacteria in skim milk to which a small quantity of calcium phosphate has been added.

1. Mix the calcium phosphate supplied in the packet with skim milk. Use the quantity of skim milk printed on the packet.

2. Transfer the bacterial slime from the surface of the jelly in the bottle to the mixture. To do this, pour a little of the milk into the bottle and, putting the thumb over the mouth of the bottle, shake vigorously: then pour back into the rest of the mixture. Repeat this several times until all the bacterial slime has been washed off the jelly.

Note.—The jelly is only the medium on which the bacteria live and it need not be removed from the bottle. While shaking the bottle to remove the bacterial slime the jelly will be broken up. This is of no importance and the larger pieces may be picked out with the fingers and discarded. Do not apply heat to dissolve the jelly.

3. Pile the seed on a clean surface and pour the mixture over the seed, a little at a time, thoroughly mixing the seeds with the hands while doing so to ensure that every seed is wetted.

4. Spread the seed in a cool, shady place to dry.

Sowing.

Inoculated seed should be sown within two days of inoculation. The best practice is to inoculate the seed in the afternoon and to sow the next morning in a moist seed bed.

Exposure to sunlight kills the bacteria, so seed should be drilled in, or, if broadcast, harrowed in soon after. Contact with artificial fertilizers (such as superphosphate) will destroy the bacteria. Fertilizer should be applied separately a day or two before planting, or the seed and fertilizer should be run through separate drills if sowing and fertilizing are carried out together.

Team for Pineapple Work.

An important co-ordinated scheme for improved Departmental services to the pineapple industry, a feature of which is investigations aimed at developing the industry in North Queensland, has been announced by the Minister for Agriculture and Stock (Honourable H. H. Collins).

A team of eight officers from the Science and Horticulture Branches of the Department will concentrate on research and advisory work on pineapples in an effort to increase yields, lower production costs, ensure greater efficiency in the industry, and, by demonstrating better handling methods in marketing the fruit, obviate wastage and financial loss.

Mr. Collins said that the pineapple industry was particularly important today because it is dollar earning, with Canada offering a big market for the canned product. Besides providing better services for established growers the new arrangement would give the many ex-servicemen who had entered the industry the advantage of the best possible advice on their undertaking.

Mr. R. C. Cannon will be in charge of the Departmental team. The field advisory work will be supervised by Mr. P. Mitchell (Senior Adviser in Horticulture), with whom will be associated officers at Nambour, Caboolture and Gympie. Experimental work on pineapples in North Queensland will be in charge of Mr. E. P. Williams, who is also a Senior Adviser in Horticulture. Various field and other investigations will be carried out at the Ayr Regional Experiment Station and other centres. Among the most important of these will be investigations concerned with the cost of production of pineapples in North Queensland and the practicability of growing the crop economically for canning in that part of the State.

Mr. Collins added that Mr. H. M. Groszmann of the Department's horticultural staff at Nambour, has practically completed the current programme of developing superior pineapple types, and planting material of these should be available to growers shortly.

Lime for Agricultural Purposes.

F. B. COLEMAN, Standards Officer, Standards Branch.

(*Continued from page 136 of September issue.*)

LIME CARBONATES.

Pulverised Limestone, Pulverised Marble, Pulverised Coral, or **Pulverised Shells** are the respective natural materials after treating by passing through a crushing or pulverising machine.

The percentage of lime (CaO) varies according to the purity of the original material; the lime is in the form of calcium carbonate. *Pulverised limestone* varies in quality, but, generally speaking, is a fairly high-grade source of lime. It must be ground in a pulverising machine, as is explained elsewhere under the heading of "*Fineness.*"

The degree of fineness is an important factor governing its value. The natural impurities usually present are chiefly magnesia, iron, alumina and silica.

Coral.—Coral lime can be obtained at low tide from reefs in the tropics by a process of quarrying aided by explosives.

It has in the past been loaded on barges, taken to the mainland, and pulverised; in certain cases it has been broken into pieces and burnt, as explained in the section on "Burnt Lime."

A product of coral formations found in shallow water in certain parts of the sea bed along the Queensland coast is also used as lime for agricultural purposes. This is handled by dredging, and although fairly dirty in appearance, it may be made to analyse fairly high in lime content by selection, washing, &c.

The lime is all in the carbonate form, as in the original coral. As fairly large pieces of coral are present, drying and grinding are necessary.

Earthy Lime consists of lime carbonate which is in a naturally disintegrated or friable condition, and is dug out after removal of the "overburden." It is comparatively impure and of a softer nature than limestone.

It sometimes needs very little treatment before being offered for sale, but to be sure that it complies with the fineness requirements of the Fertilizers Act, earthy lime should be ground and/or screened before being bagged.

The lime (CaO) content varies according to the purity of the material—as in pulverised limestone—and is wholly present in the form of calcium carbonate.

MAGNESIAN LIMES.

Magnesium or Dolomitic Lime Carbonates.—A number of natural limestone or earthy lime deposits contain an appreciable quantity of magnesia. When this type of material is marketed in Queensland the minimum percentage of magnesia (MgO) as well as the minimum percentage of lime (CaO) must be declared on the label for the information of the purchaser, who may decide from these percentages whether the product is suited for his particular purpose or otherwise. The neutralising value to which both the lime and magnesia contribute must be declared also. The percentage of lime (CaO) and magnesia (MgO) together found on analysis must total not less than 35 per cent.

Of course, practically all naturally occurring lime carbonates contain a small amount of magnesia.

Fineness is of the same importance with all of these carbonates. It should be noted that the maximum percentage stated on the label refers to magnesia (MgO)—not magnesium carbonate ($MgCO_3$). This is comparable to the declaration of the percentage of lime (CaO) and not calcium carbonate ($CaCO_3$), as explained in the section on "Labels."

GYPSUM.

Gypsum is a naturally occurring form of lime, and may be described as dihydric calcium sulphate ($CaSO_4.2H_2O$).

It is very little used in Queensland, and although it has a minimum lime (CaO) content of 25 per cent., it has no neutralising value.

One such material is registered in Queensland under this name.

MISCELLANEOUS LIMES.

From time to time limes for agricultural purposes are placed on the market that owing to the quality of the material used, or difficulties involved in the process of manufacture or preparation, or other factors, do not compare with limes in the group to which they purport to belong.

In these cases they are classified as "miscellaneous" to allow purchasers to value them on their own merits apart from any group in which they would appear out of line.

NEUTRALISING VALUE.

The term neutralising value applies to all limes for agricultural purposes, except gypsum, and affords a means of comparison applicable to these limes.

It is a comparative figure which denotes the ability of the lime in question to neutralise acidity, which is one of the main purposes for which lime is used.

It is a figure ascertained practically, and would include any other carbonates or basic materials present.

The standard of comparison is 100 per cent. pure calcium carbonate, which would have a neutralising value of 100.

Comparative neutralising values would be:—

Burnt lime	160
Slaked lime	120
Pulverised limestone	90
Processed lime	86
Earthy lime	80

FINENESS.

With respect to lime sold for agricultural purposes, fineness is of importance with earthy lime, pulverised limestone, pulverised marble, and other pulverised carbonates, and also processed lime.

Magnesian limes are, of course, included here.

"Fine" means particles that will pass a sieve with apertures $\frac{1}{100}$ inch square.

The whole of the limes to which fineness applies must pass a sieve with apertures $\frac{1}{8}$ inch square.

Burnt lime is not affected by fineness, and the resultant slaked lime is also exempt from this provision.

Carbonates with equal neutralising values may be compared on a fineness basis.

The reason why fineness applies to earthy lime, processed lime, pulverised limestone, and other pulverised carbonates, and not to burnt or slaked lime, may be set down as follows:—

It has been repeatedly proved that lime carbonates, unless in a fine state of division, are not rapidly absorbed by the soil, being insoluble in pure water and only slowly soluble in slightly carbonated water—that is, water containing carbon dioxide in small quantity.

The following extract from a bulletin prepared by H. W. Kerr and C. R. von Stieglitz—"The Value of Different Forms of Lime"—is not only well worth repetition but should be very carefully borne in mind by every lime purchaser:—

> "Other things being equal, the finer the condition of the agricultural lime, the quicker will favourable results be obtained. Particles coarser than $\frac{1}{10}$ inch in diameter are practically worthless, and in a country where lime costs are so high the farmer should pay particular attention to this consideration."

Artificial grinding (or screening) is therefore necessary with these materials.

Burnt lime, however, is in large lumps when sold, and of its own accord breaks down on slaking—either artificial or natural—to a fine powder. This powder being usually largely hydroxide when applied, is fairly water-soluble and is absorbed readily by the soil. Also, the fineness of the powder is greater than could be obtained by normal grinding processes.

No artificial grinding is therefore necessary, and a fairly uniform absorption by the soil is obtained from all burnt or freshly slaked limes.

The table at the end of this article sets out the various limes being offered for sale within the State.

GROUP NAMES.

The use of names indicating the groups to which the particular limes relate is of importance.

For instance, a purchaser uses the name "Burnt Lime." Now, providing names used are a correct indication, any burnt lime registered would have a neutralising value that should be associated with burnt lime, e.g., say, at least 160.

If he orders a pulverised limestone, irrespective of "specific designation," he would get a material with a neutralising value of, say, at least 90, and with earthy lime, say, 70 to 90.

In addition, with the use of the name "Burnt Lime," he can dispense with fineness, whereas, with pulverised limestones, earthy limestones, &c., he has two factors of importance—neutralising value and fineness.

In short, limes may readily be compared with other limes in their own respective groups, and the strict adherence to this grouping with respect to the names used on the labels is of importance in allowing this comparison to be easily made.

LABELS.

The method of labelling lime with respect to lime content (as indicated in the table) is as follows:—

The percentage or percentages of lime (CaO) and the respective forms in which it occurs must be stated. This means that, with slaked limes or carbonates, not the percentage of calcium hydrate and percentage of calcium carbonate should be stated, but the percentages of calcium oxide—lime (CaO)—that are present in each of these forms.

Let us take a partially air-slaked lime for an example. This may consist actually of—

50 per cent. calcium oxide,

40 per cent. calcium hydroxide, and

5 per cent. calcium carbonate,

with, say, 5 per cent. impurities.

Now, in the calcium hydroxide and calcium carbonate only the percentages of calcium oxide (CaO) can be called active constituents.

To compare with burnt lime containing, say, 90 per cent. lime (CaO), all as calcium oxide, this lime must be reduced to a common basis. In other words, to compare with a material that has lime present only as calcium oxide (CaO), the percentages of calcium hydroxide and calcium carbonate must also be reduced to the amount of calcium oxide (CaO) that they contain—the forms in which the calcium oxide (CaO) occurs being, of course, also stated.

Thus, the label would read—

50 per cent. lime (CaO) as calcium oxide
30 per cent. lime (CaO) as calcium hydroxide
2·8 per cent. lime (CaO) as calcium carbonate

Total 82·8 per cent. lime (CaO).

On this figure the material can then be compared with any other lime on a total lime (CaO) basis.

Of course, the neutralising value gives a definite method of comparison, but it includes magnesia and other neutralising material, and is a comprehensive figure only; also, the neutralising value does not indicate the form or forms in which the calcium oxide occurs, and is of value only with respect to neutralising soil acidity.

It is provided by the Fertilizers Act that all limes for agricultural purposes shall be labelled in such a manner as to set out:—

The kind of lime;

The percentage of lime (CaO) and the form or forms in which it occurs;

The maximum percentage of magnesia (MgO);

The neutralising value;

The net weight;

The percentage of fineness (except in the case of lime which has been burnt); and

The name and address of the manufacturer or dealer.

The following sets out examples of labels:—

BURNT LIME FOR AGRICULTURAL PURPOSES.

When packed, lb. net.

90 per cent. lime (CaO) as Calcium Oxide.

Neutralising Value, 160.

(Name and Address of Manufacturer or Dealer.)

PULVERISED LIMESTONE FOR AGRICULTURAL PURPOSES.

When packed, lb. net.
50 per cent. lime (CaO) as Calcium Carbonate.
Neutralising Value, 90.
Fine, 80 per cent. Coarse, 20 per cent.
(*Name and Address of Manufacturer or Dealer.*)

EARTHY LIME FOR AGRICULTURAL PURPOSES.

When packed, lb. net.
45 per cent. lime (CaO) as Calcium Carbonate.
Neutralising Value, 80.
Fine, 65 per cent. Coarse, 35 per cent.
(*Name and Address of Manufacturer or Dealer.*)

MAGNESIAN EARTHY LIME FOR AGRICULTURAL PURPOSES.

When packed, lb. net.
43 per cent. lime (CaO) as Calcium Carbonate.
7 per cent. Magnesia (MgO) as Magnesium Carbonate.
Neutralising Value, 85.
Fine, 60 per cent. Coarse, 40 per cent.
(*Name and Address of Manufacturer or Dealer.*)

This article deals only with the legislation controlling the sale and quality (both chemical and physical) of the various limes for agricultural purposes that are sold within this State.

Any information desired as to the actual use or application to the land for specific purposes should be directed to the branches of the Department that are concerned.

SUMMARY.

The chief original source of lime for agricultural purposes in Queensland is limestone rock.

The principal kinds of lime derived from this are as follows:—

Burnt Lime.—This is made by burning lumps of limestone, and providing it is packed and railed when freshly burnt is a "concentrated" source of lime. It is to the farmer's advantage to slake burnt lime on his own property. Unfortunately the distribution of slaked lime is a very disagreeable undertaking. Ground burnt lime allows the application to be made by machine in one operation, eliminating most of the objections.

An average quality burnt lime should analyse—

90 per cent. lime (CaO) as calcium oxide, and neutralising value, 160.

Processed Lime is the resultant by-product obtained after burnt lime has been used in certain chemical processes; the lime (CaO) is chiefly in the form of carbonate.

An average quality processed lime should analyse:—

46 per cent. lime (CaO) as calcium carbonate, neutralising value, 86; fine, 50 per cent.; coarse, 50 per cent.

Pulverised Limestone is the original rock quarried and ground. An average quality material should analyse:—

50 per cent. lime (CaO) as calcium carbonate, neutralising value, 90; fine, 80 per cent.; coarse, 20 per cent.

Other important limes for agricultural purposes are:—

Earthy Lime, which is an impure form of lime carbonate that can easily be worked by digging, being softer than limestone, and usually requiring screening only. An average quality material should analyse:—

45 per cent. lime (CaO) as calcium carbonate, neutralising value, 80; fine, 65 per cent.; coarse, 35 per cent.

Magnesian Limes for Agricultural Purposes, which are pulverised limestones or earthy limes containing appreciable quantities of magnesia.

The minimum percentage of magnesia (MgO) as magnesium carbonate as well as the minimum percentage of lime (CaO) as calcium carbonate must be declared on the label, and this should be considered by the farmer with a view to the application of the material for particular purposes.

Efficiency of Lime for Agricultural Purposes.—Limes which have been burnt may be compared on a neutralising value basis only.

Other forms of lime may be compared within their own respective groups on a neutralising value and fineness basis, except where the percentage of magnesia is appreciable, when this must be treated as another important factor.

Labels should set out the—

Kind of lime;

The percentage of lime (CaO) and forms in which it occurs;

The minimum percentage of magnesia (MgO);

the neutralising value;

The net weight;

The fineness (unless prepared by burning);

The name and address of the manufacturer or dealer.

Buyers of lime of a greater value than 10s. should receive an invoice bearing the warranty required by the Act with respect to the quality of the article.

On no account should purchasers accept delivery of lime for agricultural purposes that is not labelled and invoiced in the manner outlined above.

All complaints or inquiries should be addressed to the Standards Branch, Department of Agriculture and Stock, Brisbane.

LIMES FOR AGRICULTURAL PURPOSES.

REGISTERED UNDER "*The Fertilizers Act of* 1935," AS AT 10TH JUNE, 1949.

Name and Address of Dealer.	Brand.	Guaranteed Analysis.					
		(CaO) Lime.	In the Undermentioned Form.	Magnesia (MgO) as Magnesium Carbonate.	Neutralising Value.	Fine.	Coarse.
		Min. %		Min. %	Min.	Min. %	%
Burnt Lime—							
A.C.F. and Shirleys Fertilizers Limited, Brisbane	A.C.F.	90	As Oxide		160		
Ambrose Lime Works, Ambrose	Ambrose	90	As Oxide		160		
Crotty Lime Works, Ootan	Crotty	90	As Oxide		160		
Ryan Lime Company (Pty.) Limited, Calcium	Ryan	90	As Oxide		160		
Tamaree Lime Works, Gympie	Tamaree	82·5	As Oxide		151		
Burnt Lime- Pulverised—							
Ryan Lime Company (Pty.) Limited, Calcium	Ryan	85	As Oxide		150		
*Slaked Lime—							
Tamaree Lime Works, Gympie	Tamaree	2·5 34·3 18·6	As Oxide As Hydroxide As Carbonate		124		
Processed Lime—							
Australian Chemical Company (Pty.) Limited, South Brisbane	Acco	47	As Carbonate		88	35	65
Fertiliser Distributors Pty. Limited, Brisbane	F.D.L.	47	As Carbonate		88	50	50
Mewing and Sons, T., Brisbane	Processed Lime	47	As Carbonate		88	50	50
Pulverised Limestone, Marble, &c.—							
A.C.F. and Shirleys Fertilizers Limited, Brisbane	A.C.F.	50	As Carbonate		90	50	50
Ambrose Lime Works, Ambrose	Ambrose	50	As Carbonate		90	84	16
Crotty Lime Works, Ootan	Crotty	51	As Carbonate		92	77	23
Fertiliser Distributors Pty. Limited, Brisbane	F.D.L.	50	As Carbonate		90	84	16
Marberite Company Pty. Limited, Brisbane	Farmers	55	As Carbonate		99	75	25
Northern Lime Co., Mossman		50	As Carbonate		90	65	35
Queensland Pastoral Supplies Pty. Limited, Brisbane	Hibiscus	52·4	As Carbonate		95	75	25
Richards and Sons, H. J., Toowoomba	Agricultural	50	As Carbonate		90	60	40
Ryan Lime Company (Pty.) Limited, Calcium	Ryan	50	As Carbonate		85	50	50

*Also Limil—*see* Hydrated Lime.

Earthy Lime—							
Inkerman Lime Company, Home Hill	Magnesium Earthy	43	As Carbonate	7	85	60	40
Ryan Lime Company (Pty.) Limited, Calcium	Ryan	44	As Carbonate	..	78	65	35
Webb and Webb, Reid River	..	42	As Carbonate	..	75	65	35
Magnesium Lime—							
The Poultry Farmers Co-operative Society Limited, Brisbane	Red Comb ..	21	As Carbonate	18	78	60	40
Hydrated Lime—							
Brett and Company Pty. Limited, Brisbane	Limil	65	As Hydrate	3·0	123	..	..
Miscellaneous Lime—							
Australian Plaster Industries Pty. Limited, Brisbane ..	Victor Gypsum	1·0	As Carbonate	..	..	..	..
		30	As Sulphate (Sulphur as trioxide 17%)			60	40

Horticultural Districts of Queensland.

2.—THE LOCKYER VALLEY.

A. M. RICHARDSON, Adviser in Horticulture.

THE valley of the Lockyer Creek, a tributary of the Brisbane River, includes the most compact and extensive area of irrigable alluvial soil in Queensland. It is about 40 miles long, two to 10 miles wide, and lies between the coastal ranges and the main Divide which passes through Toowoomba. The catchment area is approximately 1,000 square miles. The main creek is fed by tributary streams, including Laidley Creek, Tent Hill Creek, Ma Ma Creek and Flagstone Creek, which drain the coastal side of the Dividing Range. The main townships in the area are Laidley, Gatton, Helidon, Grantham and Lowood. All these towns, with the exception of Lowood, lie on or near the main road and rail links between Brisbane and Toowoomba. They are 300-600 feet above sea level.

CLIMATE.

The climate of the district may be classed as sub-coastal, and is mainly temperate in character. The rainfall averages just under 30 inches a year and about two-thirds of it falls during the summer months. However, sufficient rain normally occurs during the winter and spring to permit the growth of short-term vegetable crops such as tomatoes, peas and beans, even in the absence of irrigation. The mean maximum temperature is 88.7 deg. F. in December and 69.1 deg. F. in June. The higher temperatures occur during the relatively dry spring and early summer. The winter is cold and frosts are common. Cold westerly and south-westerly winds which sweep through the less sheltered areas sometimes play havoc with crops growing during the autumn, winter and spring. Windbreaks (Plate 104) are therefore desirable.

TABLE 1.

Climatic Data—Lockyer Valley.

—	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Aver.
Mean Max. Temp. (F.)	88·9	88·0	85·0	80·9	74·4	69·1	68·9	71·9	77·9	83·6	87·6	88·7	80·4
Mean Min. Temp. (F.)	65·5	65·5	62·2	56·4	49·6	45·7	43·3	43·8	49·4	55·3	60·9	63·9	55·1
Average Rainfall (pts.)	412	346	317	189	155	192	132	114	157	200	280	363	2,857

Plate 104.
Windbreak of Exotic Pines Gives Protection Against Westerly Winds.

SOILS.

The soils in the greater part of the Lockyer Valley are derived from the adjacent ranges, which are in part basaltic (e.g. the Macpherson Range) but largely sedimentary in origin. The soils of the valley are therefore variable in depth, texture and composition. Extensive areas in the vicinity of Gatton, Laidley and Lowood are deep, heavy, black clay loams overlying a sandy clay. Similar, though sometimes lighter, soils flank both the main creek and the tributary streams. Adjoining the alluvials are the foothill soils of varying slope, aspect and colour. Some of these are well suited to horticultural crops and are so used by many farmers.

The heavy black alluvial clay loams are neutral to alkaline in reaction. Normally, however, these soils are adequately supplied with plant nutrients, although a response to nitrogen can be expected with most fruit and vegetable crops. Care is needed to ensure the retention of a satisfactory soil structure when irrigation is practised over long periods.

The lighter soils of the foothills and some creek flats are less fertile than the heavy alluvials. Crops grown on these soils respond to complete fertilizers. Deficiency symptoms ascribable to boron and zinc have been noted with crops such as citrus. The light soils are easily worked, but annual or perennial cover crops should be grown when the land is not being cropped. Precautions against erosion are necessary on some slopes.

The area of irrigable land in the Lockyer Valley is estimated at 72,000 acres. About 80 per cent. of this can be classed as fertile. The balance, much of which is suitable for some fruit and vegetable crops, is of fair to poor quality.

Irrigation water is sometimes drawn direct from the creeks, but most farmers pump from wells which tap underground supplies at depths of 40 to 100 feet. A number of weirs (Plate 105) constructed

Plate 105.

WEIRS ASSIST FARMERS PUMPING DIRECT FROM LOCKYER CREEK AND RAISE THE WATER LEVEL IN WELLS USED FOR IRRIGATION.

on the Lockyer to conserve water have the effect of raising the water level in the wells. The underground water is on the whole suitable for irrigation but in some areas it tends to be saline, particularly during long periods of dry weather. Wells with salinity problems are usually near the upper reaches of some tributary streams. Pumps are powered by electricity, which is available at reasonable rates (about 2s. 6d. to pump one acre-inch) in at least the more closely settled areas. Overhead irrigation is more or less general and most of the better-known distribution systems are represented in the district.

VEGETATION.

In its virgin state the Lockyer Valley carried a variety of vegetation types. Rain forest occurred on alluvial soils fringing the creeks and also on foothills with good soil, adequate moisture and a warm aspect. The species distribution was normal for this type of country in southern Queensland. Elsewhere, with the exception of some small natural plain and treeless areas, the country could be classed as

savannah woodland. On the richer, well-drained forest alluvial soils, blue gums, bloodwood trees and Moreton Bay ash were characteristic. In the dry, sandy types of soil, spindly and free-suckering eucalypts grew freely, with grey box as the dominant type. Some of the poor ridgy country was covered with narrow-leaved ironbark.

Most of the better land in the Lockyer Valley has now been cleared but timbered pockets still remain in the less well developed areas and in sanctuaries under the Fauna Protection Act.

HORTICULTURAL USES.

The status of horticultural crops in the Valley is something of an enigma. The district has been settled for a long time. Good fruit and vegetable crops can be grown on the variety of soil types available and potential markets are close. In spite of these facts, the area under horticultural crops is still comparatively small and production methods are, with some notable exceptions, less efficient than in other districts.

Citrus.

Most of the citrus orchards (Plate 106) are situated in the upper Lockyer and some of the original plantings made 60 years ago are

Plate 106.
CITRUS ORCHARD NEAR THE FOOTHILLS ON THE UPPER REACHES OF THE LOCKYER VALLEY.

still in production. Fine-textured irrigable soils on the north side of Helidon and Grantham, with a reputation for the production of high quality fruit, are being selected wherever practicable for new plantings. The main orange varieties grown are Washington Navel, Late Valencia and Joppa, but Siletta and Jaffa are represented in some orchards. Mandarins are not grown extensively, although small areas of Emperor, Ellendale and Glen Retreat varieties are in production.

In some respects, the soil and climate of the Lockyer differ from those of other citrus districts. Particular interest is, therefore, taken in stock-scion relationships, which have a bearing on both the quality of the fruit produced and the life of the orchard. Soil management problems are also responsible for original practices, one of which is the use of a surface mulch on non-irrigated orchards to induce consistent cropping in shy-setting varieties. The mulch, Sudan grass or some other bulky crop, is carted on to the orchard during the autumn.

Vines.

Vineyards are established at Coominya and Helidon on some well-drained soils in warm areas. These localities are relatively free from late spring frosts, which are a hazard to vignerons in some other areas. Early varieties, such as Royal Ascot and Muscat-Hamburg, are normally grown and the crop has proved payable.

Tomatoes.

The tomato crop is grown mainly on the warm foothills of the upper Lockyer and in rich hillside pockets elsewhere. Two crops are normally grown each year, an early crop which is planted in August and a late crop which is planted in January or February. The latter crop, though profitable if seasonable conditions are favourable, is rather speculative owing to the incidence of some wilt diseases which thrive in hot weather. Varietal preferences differ, but growers tend to use local seed selected from the varieties Rutgers and Valiant.

Other Fruits.

Melons are grown primarily for the summer market in both Brisbane and Toowoomba. They are planted on the rich creek loams and crops are usually good and very profitable. The principal variety is Kleckley Sweet.

Vegetables.

In the more important horticultural areas, cabbages, cucumbers, lettuce and other vegetables are grown regularly each year. Elsewhere in the Lockyer Valley, land which is not required for agricultural purposes is often sown to vegetable crops by shrewd farmers who sense the prospect of a bare market. For example, in 1948-49 late spring frosts upset Stanthorpe production schedules and some Lockyer farmers then immediately planted early maturing vegetables for marketing before the mid- and late-season crops were harvested at Stanthorpe.

Cabbages thrive best on the heavy, black soils at Grantham and Gatton. It is a common practice to seed the crop directly into the field and thin the rows of seedlings by hoe. Crops grown in this way yield heavily and compare favourably with normal market garden crops grown from seedlings transplanted into the field. The bulk of the crop is trucked direct from the farm to Toowoomba and other inland towns. The main varieties are Vanguard and Utility.

Lettuce are grown in winter and early spring, particularly for the Toowoomba market. Warm frost-free situations are chosen for this crop and the main variety grown is Imperial 615, which produces under these circumstances a small compact head. Returns to the grower from this crop are usually very good.

The cucumber is planted in early spring and harvested in summer. A number of varieties are grown but the most successful are Early Fortune and White Spine.

Horticultural Production.

Table 2 shows the estimated horticultural production in the Lockyer Valley in 1948-49.

TABLE 2.

ESTIMATED HORTICULTURAL PRODUCTION, LOCKYER VALLEY, 1948–49.

Crop.	Area.		Estimated Production.
	Acres.		
Tomatoes	36		7,777 ½ bushel cases
Melons—Water	29		86 tons
Melons—Rock	4		14 tons
Cabbages	48		10,759 dozen
Lettuce	⅝		170 bushels
Cucumbers	16		1,158 bushels
	No. of Trees.		
	Not Bearing.	Bearing.	
Oranges	5,004	9,169	23,779 bushels
Mandarins	1,339	3,320	5,247 bushels
	Area—Acres.		
	Not Bearing.	Bearing.	
Grapes—Table	13	69	224,684 lb.
Grapes—Wine	1	3	1,500 lb.

MARKET OUTLETS.

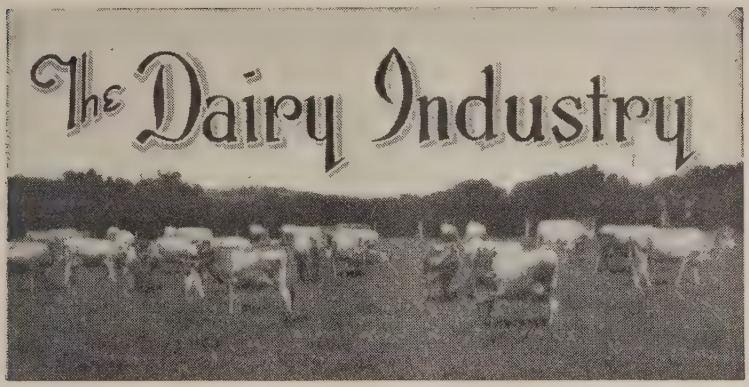
At the present time, the bulk of the fruit and vegetables produced in the Lockyer Valley has to be trucked from the farm and railed to the market. Most of it goes to Brisbane, but part is forwarded to Toowoomba and Sydney. Some growers, particularly fruit growers, not only supply the market but also conduct a substantial country order trade. With the more perishable vegetables, some deterioration takes place in transit to the Brisbane market. However, when improved methods of transport become available, Lockyer vegetable growers should be able to compete on better terms with producing areas nearer to the city.

THE FUTURE.

There is room for much expansion in horticultural enterprises in the Lockyer Valley. Future developments will no doubt follow the existing pattern of production, with tomato and vegetable production on the warm foothills of the Dividing Range and other frost-free areas where the soils are fertile and easily worked, citrus orchards on the deep sandy loams adjacent to the creek, and vineyards on the warm sandy soils at Helidon and Coominya.

One particularly attractive area at Spring Creek, north of Gatton, has so far scarcely been tapped for horticultural purposes. In this locality there are hundreds of acres of red, sandy loam with ample underground water for irrigation and well suited to both citrus and vines. Though somewhat isolated at present, good roads and other amenities must come to the area sooner or later as settlement proceeds. In the meantime, land values are reasonably low compared with those in the more closely settled areas.

There seems little doubt that fruit and vegetable growing in the Lockyer will some day become more important than at present. The rate of development may depend on the stimulus of marketing opportunities and the wider appreciation of the district's potentialities.



Detergents and Chemical Sterilizers.

D. S. ROBERTSON, Dairy Adviser.

CONFUSION appears to exist amongst many dairy farmers as to the meaning and use of detergents and chemical sterilizers in the dairy, and it is not uncommon to find the latter being used for the former and vice versa. The purpose of this article is to distinguish between detergents and sterilizers and acquaint farmers with the use of these preparations.

In a dairy sense, the function of a detergent is to remove milk deposits and other foreign matter from the surface of dairy equipment. A chemical sterilizer is used to kill any bacteria that may be present on the surface of otherwise clean dairy equipment.

How Detergents Act.

As previously mentioned, the function of a detergent is to remove milk deposits from the surface of dairy equipment, and for a substance to do this effectively it must possess certain well-defined properties. The milk deposit can be removed if a film of liquid can be forced between it and the surface to which it adheres, and as alkaline solutions wet the surface and form emulsions with fats they facilitate removal of milk residues. Hence all detergents in common use in the dairy are highly alkaline. The most common dairy detergents are caustic soda, washing soda, and proprietary dairy cleaners marketed under various trade names.

How To Use Detergents.

Before attempting to use a detergent, the dairy equipment should first be rinsed with cold water to remove all traces of milk. After this has been done, the equipment should be washed in sufficient water containing the correct amount of detergent, the temperature of the solution being just comfortable for the hands. If excessively hot detergent solutions are used they will hinder the cleansing effect by tending to precipitate casein and to cause gummy deposits to pack harder on to the metal surfaces. The prepared cleansers should always be used in the strengths recommended by the manufacturers,

who are aware of the chemical composition of the product. Other detergents, such as caustic soda or washing soda, should be used as advised by the local Dairy Officer or Adviser.

It is not sufficient to splash the detergent solution over the surface of the utensils. The scrubbing brush should be used vigorously to aid in the removal of fat and casein, and all pipes should be cleaned with a suitable pull-through brush. Scrubbing brushes and proper pipe brushes only should be used. Rags should find no place in dairy cleaning.

After thoroughly washing the equipment with the cleaning solution or detergent, all articles should be sterilized by means of boiling water or steam. If sterilization is practised, the equipment should first be rinsed with hot water to remove all traces of cleanser.

From the above it can be seen that a detergent is a "cleaner." Its sole use is to clean dairy equipment by removing milk particles, fat and dirt. It is not a sterilizer.

Chemical Sterilizers.

There are many chemical compounds which effectively destroy bacteria, but the majority are poisonous or taint milk and its products. For this reason they are unsuitable for dairy purposes. The choice is thus strictly limited and at present chlorine preparations are most commonly used, since they are effective sterilizers and in *dilute* solutions are not poisonous nor tainting to milk and cream.

Chlorine sterilizers are of two general types—namely, inorganic and organic compounds. To the inorganic group belong the hypochlorites of calcium and sodium. The organic chlorine compounds are represented by the chloramines, such as chloramine-T. The inorganic compounds, in the form of the hypochlorites, are the type in common use on Queensland dairy farms.

How Chemical Sterilizers Act.

Chlorine is the active sterilizing constituent in hypochlorite compounds. The solutions do not emulsify fats and unless the surfaces on which they are used have been previously cleaned with a detergent solution their action is impeded and they cannot sterilize effectively. Furthermore, these preparations should always be used in accordance with the printed directions on the tin or package, for the strength of the available chlorine may vary with different preparations. The most convenient way of handling these sterilizers is to make up a "stock solution" of the preparation, as directed by the manufacturer, and then bottle this solution in clean, dark bottles. A known amount of this solution, when added to a four-gallon bucket of clean water, will give a sterilizing liquid of the required strength. The bottles should always be kept in a cool, dark place, as heat and strong light will reduce the strength of the stock solution.

When to Use Chemical Sterilizers.

Chemical sterilizers should always be employed at least 20 minutes before using the dairy equipment. Their aim is to destroy any bacteria which may have gained access to the utensils between the time of cleaning and the time of use. The bacteria may be carried to the plant and utensils by dust, or the utensils may become contaminated

by contact with unsanitary draining racks. These preparations should not be applied immediately after using the plant, for prolonged contact with the metal will cause serious corrosion.

How to Use Chemical Sterilizers.

At least 20 minutes before milking begins, the chlorine solution should be run through the machines, using half a gallon of the liquid for each unit. This is caught in the milk vat and, after rinsing the vat, is run over the milk or cream cooler. The buckets, strainer and cans for holding the market milk or cream are next rinsed, and the liquid is then retained and used for washing the udder and teats of the cows prior to milking. When using chlorine solutions for this purpose, the fluid should be changed frequently, for when it becomes dirty and contaminated it loses its germicidal properties. If the machines and utensils have been previously thoroughly cleaned with a suitable detergent, and the above routine has been carried out, using the chlorine solution at the correct strength, it may be assumed that the plant is as near sterile as is possible to get it under practical farm conditions.

The temperature of the chlorine solution is most important. One of the chief advantages of chemical sterilizers is that they are effective at ordinary temperatures. The temperature of the chlorine solution should never be greater than lukewarm. High temperatures hasten the liberation of the chlorine, especially with most hypochlorites of calcium and sodium on the market at present, and when solutions containing these preparations are heated above lukewarm the chlorine escapes so rapidly that there is a danger of its being lost before the sterilizing principle takes effect.

The Benefits of Chemical Sterilizers.

It will now be apparent that chemical sterilizers, in the form of chlorine solutions, are a valuable aid to the dairyman in his eternal fight against bacteria. They are not to be used for cleaning purposes, nor will they dispense with steam sterilization, owing to the fact that they are less penetrative than steam, but they are invaluable in destroying bacteria in previously cleansed dairy equipment. Experience has shown that, where chlorine solutions are properly employed, better quality milk and cream is possible, justifying their use in the dairy.

TUBERCULOSIS-FREE CATTLE HERDS
(AS AT 1st OCTOBER, 1949).

Breed.	Owner's Name and Address of Stud.
Aberdeen Angus	The Scottish Australian Company Ltd., Texas Station, Texas.

Queensland Butter Production, 1948-49.

Compiled by the Division of Dairying.

THE output of Queensland butter factories for the year ended 30th June, 1949, was 105,720,540 lb. The good seasonal conditions which prevailed throughout the previous year continued well into this year and production exceeded that of 1947-1948 by 1,662,856 lb.

Fluctuations in production since the record year of 1938-1939 are shown in the following table:—

Year.	Tons.
1938-39	68,919
1939-40	62,308
1940-41	52,268
1941-42	42,712
1942-43	49,782
1943-44	45,275
1944-45	42,413
1945-46	45,197
1946-47	33,304
1947-48	46,454
1948-49	47,197

Prices.

Consequent upon the arrangement whereby dairymen were to receive a price based on estimated costs of production, a further survey of costs was made in the early part of 1948. As a result, the net price return to factories was raised to a figure which would permit a price of 2s. 2d. per lb. commercial butter being paid in the year under review. This represented an increase of 2d. per pound on the figure set for the previous year and it was financed by increased home consumption and United Kingdom contract prices as well as by the continuance of Government subsidy.

The average pay-out to butter factory suppliers in recent years has been as follows:—

Year.	Commercial Butter. per lb.	
	s.	*d.*
1938-39	1	1.55
1939-40	1	2.02
1940-41	1	1.88
1941-42	1	1.63
1942-43	1	3.9
1943-44	1	6.8
1944-45	1	7.9
1945-46	1	7.9
1946-47	1	8.29
1947-48	2	1.34
1948-49 (estimated)	2	2.5

Gradings.

Of the total butter production, 86.2 per cent. was officially examined by Commonwealth and State grading staffs.

Grading results were:—

	Boxes.	Per cent.
Choice grade	688,149	42.27
First grade	832,980	51.16
Second grade	95,934	5.89
Pastry grade	11,109	.68

Butter quality has shown a considerable decline in comparison with the previous year, a contributing factor being the serious degrading due to weed taint in the winter and spring months.

The accompanying tables cover the operations of individual factories for the year. The figures for make and pay are compiled from the monthly returns which each factory is required to furnish to the Department of Agriculture and Stock under the Dairy Produce Acts, and the total quantity of butter and the quantity of each grade made by each factory are shown. The pay figures show the total quantity of butter and the quantity of each grade for which suppliers have been paid.

An examination of the two sets of figures will show whether the quantity of butter manufactured in each grade can be reconciled with the quantity paid for. While some improvement has been noted in this connection it appears that some factories are still showing a tendency towards paying higher rates for cream than the grade justifies. It is difficult to understand the outlook of the manager or director who is prepared to build up his factory's output by accepting inferior cream and paying choice rates for it. Suppliers who feel inclined to accept offers of this nature should reflect that such apparent generosity can only be at the expense of their fellow dairymen or themselves. After all, second grade cream will make only second grade butter and second grade butter brings only second grade prices.

The official gradings show what has happened when the factory gradings have been checked by the Commonwealth and State graders. These official gradings are a check on the accuracy of factory gradings, though it is possible for inefficient pasteurisation or manufacture, as well as some weed taints which cannot be detected in cream when cold, to cause apparently choice butter to be degraded. It has to be remembered, too, that in many cases portion of a factory's manufacture is sold on the local market and is not subject to official grading. The percentage of output graded is shown and this should be borne in mind when comparisons are being made.

Summary of Production and Gradings.

MANUFACTURE IN LB.

Total.	Choice.	First.	Second.	Pastry.
105,720,540	62,886,638	38,407,804	4,407,282	18,816

PAY IN LB.

Total.	Choice.	First.	Second.	Pastry.
105,545,922	64,218,909	37,519,444	3,807,347	222

OVERRUN.

Actual	3.07 per cent.
Paid	3.1 per cent.

PRODUCTION, PAYMENTS, AND GRADINGS OF BUTTER IN QUEENSLAND, FOR THE YEAR ENDED 30TH JUNE, 1949.

Factory.		Manufacture and Payments in Lb.					Over-run.		Make Graded.
		Total.	Choice.	First.	Second.	Pastry.	Actual.	Paid.	Per Cent.
Atherton	Make	2,146,421	2,146,421	..	..	..	70,713	72,814	52·05
	Pay	2,148,522	2,134,433	..	14,089	..	3·41%	3·51%	..
Caboolture	Make	2,015,022	1,816,687	198,335	..	..	68,253	69,461	72·73
	Pay	2,016,230	1,874,276	139,051	2,903	..	3·51%	3·57%	..
Eumundi	Make	1,928,865	1,707,804	221,061	..	..	74,541	75,170	89·44
	Pay	1,929,494	1,745,935	183,522	37	..	4·02%	4·05%	..
Pomona	Make	1,479,832	1,423,378	56,454	..	..	37,875	38,415	92·6
	Pay	1,482,372	1,455,559	24,482	331	..	2·63%	2·66%	..
Chinchilla	Make	2,042,156	895,556	932,176	214,424	..	32,542	33,050	95·51
	Pay	2,042,664	950,438	934,843	157,383	..	1·62%	1·64%	..
Daintree	Make	82,654	82,654	..	..	..	2,184	2,184	..
	Pay	82,654	82,654	..	..	..	2·71%	2·71%	..
Dayboro'	Make	232,407	..	232,407	..	..	..	..	35·97
	Pay*	..	..	..	..	..	..	..	..
Toowoomba	Make	2,876,234	1,773,762	874,272	228,200	..	78,597	78,313	67·15
	Pay	2,875,950	1,721,015	928,343	226,592	..	2·81%	2·80%	..
Clifton	Make	1,161,552	760,872	393,064	7,616	..	37,453	37,465	92·65
	Pay	1,161,564	759,890	391,710	7,964	..	3·33%	3·33%	..
Crow's Nest	Make	1,552,936	764,960	756,952	31,024	..	40,470	40,503	97·48
	Pay	1,552,969	775,555	747,506	29,908	..	2·68%	2·68%	..

* Data Incomplete.

OFFICAL GRADINGS IN BOXES.

Factory.	Boxes Submitted As Choice.	Official Grading Result.				Boxes Submitted As First Quality.	Official Grading Result.			Boxes Submitted As Second Quality.	Official Grading Result.		Boxes Submitted as Pastry Quality.
		Choice.	First.	Second.	Pastry.		First.	Second.	Pastry.		Second.	Pastry.	
Atherton ..	19,949	18,573 93·1%	1,322 6·63%	54 ·27%	..	..	..	..	..	..	..	..	..
Caboolture ..	22,447	16,585 73·89%	5,810 25·88%	52 ·23%	..	3,724	3,301 88·64%	423 11·36%	..	..	..	..	..
Eumundi ..	26,868	4,205 15·65%	22,617 84·18%	46 ·17%	..	3,939	2,525 64·1%	1,414 35·9%	..	..	..	..	..
Pomona ..	23,376	16,824 71·97%	6,552 28·03%	..	..	1,094	671 61·33%	423 38·67%	..	..	..	..	..
Chinchilla ..	14,534	6,187 42·57%	7,756 53·36%	591 4·07%	..	16,354	14,932 91·3%	1,422 8·7%	..	3,593	2,813 78·29%	780 21·71%	348
Daintree ..	..	..	..	..	..	..	..	..	..	..	..	..	..
Dayboro' ..	67	..	67 100%	..	..	1,426	1,183 82·96%	243 17·04%	..	..	..	..	..
Toowoomba ..	15,021	14,315 95·3%	706 4·7%	..	..	16,171	15,731 97·28%	440 2·72%	..	3,299	3,059 92·73%	240 7·27%	..
Clifton	12,107	11,816 97·6%	291 2·4%	..	..	6,974	6,814 97·71%	160 2·29%	..	136	84 61·76%	52 38·24%	..
Crow's Nest ..	13,119	10,945 83·43%	2,174 16·57%	..	..	13,427	13,341 99·36%	86 ·64%	..	486	472 97·12%	14 2·88%	..

PRODUCTION, PAYMENTS, AND GRADINGS OF BUTTER IN QUEENSLAND, FOR THE YEAR ENDED 30TH JUNE, 1949—*continued.*

Factory.		Manufacture and Payments in Lb.					Over-run.		Make Graded.
		Total.	Choice.	First.	Second.	Pastry.	Actual.	Paid.	Per Cent.
Dalby	Make	2,852,472	835,128	1,955,800	61,544	..	82,372	82,452	92·59
	Pay	2,852,552	816,880	1,991,813	43,859	..	2·97%	2·98%	..
Goombungee	Make	1,793,680	804,776	987,448	1,456	..	47,510	47,511	100
	Pay	1,793,681	807,437	984,760	1,484	..	2·72%	2·72%	..
Jandowae	Make	2,108,902	894,710	1,066,016	148,176	..	61,526	61,466	97·81
	Pay	2,108,842	894,543	1,066,055	148,244	..	3·01%	3·00%	..
Miles	Make	1,169,105	133,993	875,224	159,888	..	31,174	31,167	90·58
	Pay	1,169,098	134,066	874,125	160,907	..	2·74%	2·74%	..
Esk	Make	2,323,277	1,342,297	935,256	45,724	..	71,389	71,444	96·3
	Pay	2,323,332	1,337,330	948,874	37,128	..	3·17%	3·17%	..
Evelyn Tableland ..	Make	457,566	457,566	..	..	..	18,126	17,994	40·88
	Pay	457,434	452,253	4,395	786	..	4·12%	4·09%	..
Gayndah	Make	1,641,690	981,226	574,000	86,464	..	55,337	55,446	99·67
	Pay	1,641,799	971,337	588,732	81,730	..	3·49%	3·50%	..
Killarney	Make	1,542,496	706,360	712,488	123,648	..	36,996	36,864	79·82
	Pay	1,542,364	753,035	688,656	100,673	..	2·46%	2·45%	..
Logan and Albert ..	Make	3,073,761	2,394,873	623,504	55,384	..	102,600	102,401	95·99
	Pay	3,097,519	2,474,975	579,003	43,541	..	3·43%	3·42%	..
Maleny	Make	2,372,616	2,298,080	74,536	..	..	69,191	69,129	93·37
	Pay	2,372,554	2,304,130	67,944	480	..	3·00%	3·00%	..

OFFICIAL GRADINGS IN BOXES—*continued.*

Factory.	Boxes Submitted As Choice.	Official Grading Result.				Boxes Submitted As First Quality.	Official Grading Result.			Boxes Submitted As Second Quality.	Official Grading Result.		Boxes Submitted as Pastry Quality.
		Choice.	First.	Second.	Pastry.		First.	Second.	Pastry.		Second.	Pastry.	
Dalby	11,039	10,455 94·71%	584 5·29%	..	..	35,009	34,775 99·33%	234 ·67%	..	1,077	932 86·54%	145 13·46%	39
Goombungee ..	14,455	13,128 90·82%	1,327 9·18%	..	..	17,548	17,432 99·34%	116 ·66%	..	29	29 100%	..	..
Jandowae ..	15,209	14,575 95·83%	634 4·17%	..	..	18,965	18,769 98·97%	196 1·03%	..	2,662	2,451 92·07%	211 7·93%	..
Miles	957	627 65·52%	330 34·48%	..	..	15,205	11,782 77·49%	3,423 22·51%	..	2,749	1,393 50·67%	1,356 49·33%	..
Esk	22,016	16,530 75·08%	5,486 24·92%	..	..	17,169	16,908 98·48%	261 1·52%	..	766	651 84·99%	115 15·01%	
Evelyn Tableland	2,354	2,253 95·71%	101 4·29%	..	..	977	977 100%	..	..	9	9 100%	..	..
Gayndah ..	16,920	11,222 66·32%	5,528 32·67%	170 1%	..	10,743	8,742 81·37%	1,964 18·28%	37 ·35%	1,556	1,197 76·93%	359 23·07%	..
Killarney ..	7,184	5,706 79·43%	1,478 20·57%	..	..	12,666	12,417 98·03%	249 1·97%	..	2,137	2,101 98·32%	36 1·68%	..
Logan and Albert	40,703	12,157 29·87%	28,447 69·89%	99 ·24%	..	11,008	9,516 86·45%	1,492 13·55%	..	978	965 98·67%	13 1·33%	..
Maleny ..	38,207	34,238 89·61%	3,969 10·39%	..	..	1,331	1,119 84·07%	212 15·93%	..	23	23 100%	..	..

PRODUCTION, PAYMENTS, AND GRADINGS OF BUTTER IN QUEENSLAND, FOR THE YEAR ENDED 30TH JUNE, 1949—*continued.*

Factory.		Manufacture and Payments in Lb.					Over-run.		Make Graded.
		Total.	Choice.	First.	Second.	Pastry.	Actual.	Paid.	Per Cent.
Maryborough	Make	851,002	505,100	332,798	13,104	..	21,684	22,388	30·47
	Pay	851,706	574,693	260,725	16,288	..	2·61%	2·70%	..
Biggenden	Make	1,868,490	894,173	974,317	..	..	77,191	77,850	95·95
	Pay	1,869,149	1,013,667	855,308	174	..	4·31%	4·35%	..
Kingaroy	Make	4,140,037	3,844,469	168,112	127,456	..	166,076	165,982	69·1
	Pay	4,139,943	3,885,817	152,344	101,782	..	4·18%	4·18%	..
Mundubbera	Make	2,958,488	2,528,520	286,272	143,696	..	101,979	101,780	97·61
	Pay	2,958,289	2,575,135	268,308	114,846	..	3·57%	3·57%	..
Wondai	Make	2,697,194	1,837,184	798,672	61,338	..	90,073	89,671	97·12
	Pay	2,696,792	1,929,499	719,962	47,331	..	3·45%	3·44%	..
Millaa Millaa	Make	878,772	878,772	..	..	..	18,073	14,387	36·63
	Pay	875,086	825,086	48,199	1,282	..	2·1 %	1·67%	..
Millmerran	Make	1,169,132	287,972	563,976	303,072	14,112	30,032	29,693	96·44
	Pay	1,168,793	323,377	584,660	260,756	..	2·64%	2·61%	..
Nanango	Make	2,856,947	1,573,427	1,249,696	33,824	..	84,894	84,782	98·6
	Pay	2,856,835	1,814,797	1,019,937	22,101	..	3·06%	3·06%	..
Oakey	Make	4,151,155	2,399,027	1,375,248	376,880	..	136,756	137,010	94·96
	Pay	4,151,409	2,423,114	1,428,589	299,706	..	3·41%	3·41%	..
Bundaberg	Make	1,952,800	594,138	1,358,662	..	..	58,859	59,684	74·1
	Pay	1,953,625	566,621	1,383,080	3,863	61	3·11%	3·15%	..

OFFICIAL GRADINGS IN BOXES—*continued.*

Factory.	Boxes Submitted As Choice.	Official Grading Result.				Boxes Submitted As First Quality.	Official Grading Result.			Boxes Submitted As Second Quality.	Official Grading Result.		Boxes Submitted as Pastry Quality.
		Choice.	First.	Second.	Pastry.		First.	Second.	Pastry.		Second.	Pastry.	
Maryborough ..	1,805	523 28·97%	1,262 69·92%	20 ·11%	..	2,632	2,293 87·12%	339 12·88%	..	193	38 19·69%	155 80·31%	..
Biggenden ..	15,751	9,534 60·53%	6,108 38·78%	77 ·49%	32 ·20%	16,264	15,430 94·87%	834 5·13%	..	..	..	..	..
Kingaroy	45,911	42,752 93·12%	3,159 6·88%	..	..	2,897	2,801 96·69%	96 3·31%	..	2,280	2,031 89·08%	780 10·92%	..
Mundubbera ..	43,913	16,675 37·97%	27,112 61·74%	126 ·29%	..	5,077	2,150 42·35%	2,927 57·65%	..	2,580	1,216 47·13%	1,364 52·87%	..
Wondai ..	31,373	27,135 86·49%	4,210 13·42%	28 ·09%	..	14,320	13,886 96·97%	434 3·03%	..	1,085	825 76·04%	260 23·96%	..
Millaa Millaa ..	1,704	1,668 97·89%	36 2·11%	..	..	4,044	4,044 100%	..	..	..	..	..	..
Millmerran ..	4,081	1,954 47·88%	2,127 52·12%	..	..	10,311	9,687 93·95%	624 6·05%	..	5,491	4,459 81·21%	1,032 18·79%	252
Nanango ..	27,427	19,907 72·58%	7,520 27·42%	..	..	22,301	20,640 92·55%	1,631 7·31%	30 ·14%	575	487 84·7%	88 15·30%	..
Oakey	38,735	36,212 93·49%	2,523 6·51%	..	..	24,946	24,143 96·78%	803 3·22%	..	6,713	6,687 99·61%	26 ·39%	..
Bundaberg ..	2,383	2,299 96·48%	84 3·52%	..	..	23,458	23,346 99·52%	112 ·48%	..	..	..	..	..

PRODUCTION, PAYMENTS, AND GRADINGS OF BUTTER IN QUEENSLAND, FOR THE YEAR ENDED 30TH JUNE, 1949—*continued.*

Factory.		Total.	Manufacture and Payments in Lb.				Over-run.		Make Graded.
			Choice.	First.	Second.	Pastry.	Actual.	Paid.	Per Cent.
Gladstone	Make	1,433,882	337,917	1,070,478	25,487	..	28,974	30,600	38·51
	Pay	1,435,508	381,475	1,031,471	22,562	..	2·06%	2·18%	..
Mackay	Make	639,529	228,087	411,442	..	..	15,852	17,242	..
	Pay	640,919	226,640	414,279	..	..	2·54%	2·76%	..
Monto	Make	3,916,623	2,342,091	1,524,208	45,900	4,424	86,341	86,320	93·60
	Pay	3,916,602	1,870,197	2,001,438	44,967	..	2·25%	2·25%	..
Rockhampton	Make	1,526,354	227,021	1,222,290	77,043	..	29,447	32,011	29·21
	Pay	1,527,918	232,987	1,222,117	73,814	..	1·97%	2·14%	..
Wowan	Make	2,349,168	1,160,753	1,139,469	48,946	..	33,402	52,534	92·42
	Pay	2,368,300	1,174,577	1,152,629	41,094	..	1·44%	2·27%	..
Biloela	Make	3,861,891	1,494,279	2,354,155	13,457	..	83,757	83,758	88·46
	Pay	3,861,892	1,459,528	2,390,232	12,132	..	2·22%	2·22%	..
Q.A.H.S. and College, Lawes	Make	68,519	51,551	9,968	7,000	..	972	966	25·42
	Pay	68,513	59,760	6,122	2,631	..	1·44%	1·44%	..
Boonah	Make	3,771,859	884,929	2,473,586	413,288	56	138,297	138,344	97·15
	Pay	3,771,906	960,077	2,482,664	329,165	..	3·81%	3·81%	..
Booval	Make	3,174,313	1,122,461	1,597,232	454,396	224	94,682	96,451	72·39
	Pay	3,176,082	1,186,124	1,583,136	406,822	..	3·07%	3·13%	..
Grantham	Make	2,330,902	505,238	1,735,672	89,992	..	66,521	66,541	95·44
	Pay	2,330,922	522,664	1,725,943	82,315	..	2·94%	2·94%	..

OFFICIAL GRADINGS IN BOXES—*continued.*

Factory.	Boxes Submitted As Choice.	Official Grading Result.				Boxes Submitted As First Quality.	Official Grading Result.			Boxes Submitted As Second Quality.	Official Grading Result.		Boxes Submitted as Pastry Quality.
		Choice.	First.	Second.	Pastry.		First.	Second.	Pastry.		Second.	Pastry.	
Gladstone ..	2,703	2,625 97·11%	78 2·89%	..	..	18,399	18,146 98·62%	253 1·38%	..	282	282 100%	..	..
Mackay ..	..	..	..	..	..	..	..	..	..	..	..	..	..
Monto	37,193	34,699 93·29%	2,494 6·71%	..	..	28,467	27,375 99·67%	92 ·33%	..	728	470 64·56%	258 35·44%	79
Rockhampton ..	..	..	..	..	..	6,581	5,888 89·47%	693 10·53%	..	1,382	622 45·01%	760 54·99%	..
Wowan ..	18,775	15,676 83·50%	3,061 16·30%	38 ·20%	..	19,236	18,365 95·47%	871 4·53%	..	758	373 49·21%	385 50·79%	..
Biloela	22,961	19,870 86·54%	3,091 13·46%	..	..	37,778	37,203 98·48%	575 1·52%	..	267	267 100%	..	..
Lawes	8	..	8 100%	..	..	178	130 73·03%	48 26·97%	..	125	125 100%	..	..
Boonah.. ..	13,994	5,321 38·02%	8,673 61·98%	..	..	44,284	43,858 99·04%	426 ·96%	..	7,158	6,900 96·4%	258 3·6%	..
Booval	5,086	2,862 56·27%	2,066 40·62%	76 1·50%	82 1·61%	28,150	28,029 99·57%	121 ·43%	..	7,798	7,652 98·13%	146 1·87%	..
Grantham ..	7,121	3,251 45·65%	3,870 54·35%	..	..	30,950	30,609 98·9%	341 1·10%	..	1,655	1,440 87·01%	215 12·99%	..

PRODUCTION, PAYMENTS, AND GRADINGS OF BUTTER IN QUEENSLAND, FOR THE YEAR ENDED 30TH JUNE, 1949—*continued.*

Factory.		Manufacture and Payments in Lb.					Over-run.		Make Graded.
		Total.	Choice.	First.	Second.	Pastry.	Actual.	Paid.	Per Cent.
Laidley	Make	1,817,304	829,194	910,328	77,782	..	63,631	63,628	95·15
	Pay	1,817,301	874,776	872,581	69,994	..	3·63%	3·63%	..
Lowood	Make	884,031	230,026	630,782	23,223	..	19,605	19,612	94·78
	Pay	884,032	235,584	630,669	17,779	..	2·27%	2·27%	..
Roma	Make	1,098,533	..	630,373	468,160	..	33,125	33,125	61·81
	Pay	1,098,533	146,890	536,805	414,677	161	3·11%	3·11%	..
Murgon	Make	2,678,255	1,602,113	1,055,590	20,552	..	87,706	87,970	81·91
	Pay	2,678,519	1,973,760	692,383	12,376	..	3·39%	3·40%	..
Proston	Make	1,509,627	980,147	479,136	50,344	..	46,918	46,442	98·73
	Pay	1,509,151	1,038,145	429,453	41,553	..	3·21%	3·18%	..
Kingston	Make	3,708,936	2,089,984	1,451,240	187,712	..	118,132	118,051	97·55
	Pay	3,708,855	1,145,544	1,392,879	170,432	..	3·29%	3·29%	..
Woodford	Make	1,232,866	947,434	277,872	7,560	..	41,143	46,740	94·2
	Pay	1,238,463	1,081,702	153,186	3,575	..	3·45%	3·92%	..
Allora	Make	1,416,050	1,403,797	11.301	952	..	36,632	36,478	90·63
	Pay	1,415,896	1,394,522	20,067	1,307	..	2·66%	2·64%	..
Inglewood	Make	405,776	181,832	196,392	27,552	..	10,308	9,612	78·28
	Pay	405,080	145,867	232,999	26,214	..	2·61%	2·43%	..
Mill Hill	Make	1,424,457	1,402,001	..	22,456	..	49,439	50,720	61·97
	Pay	1,425,738	1,267,676	144,515	13,547	..	3·60%	3·69%	..

OFFICIAL GRADINGS IN BOXES—*continued.*

Factory.	Boxes Submitted As Choice.	Official Grading Result.				Boxes Submitted As First Quality.	Official Grading Result.			Boxes Submitted As Second Quality.	Official Grading Result.		Boxes Submitted as Pastry Quality.
		Choice.	First.	Second.	Pastry.		First.	Second.	Pastry.		Second.	Pastry.	
Laidley ..	13,360	7,030 52·62%	6,289 47·07%	41 ·31%	..	16,136	15,852 98·24%	284 1·76%	..	1,382	1,061 76·77%	321 23·23%	..
Lowood ..	3,288	2,075 63·11%	1,213 36·89%	..	..	11,268	11,127 98·75%	141 1·25%	..	407	257 63·14%	150 36·86%	..
Roma	..	..	..	..	..	3,811	3,637 95·43%	145 3·81%	29 ·76%	8,314	8,064 96·99%	250 3·01%	..
Murgon	20,062	13,984 69·70%	6,020 30·01%	58 ·29%	..	18,761	18,553 98·89%	208 1·11%	..	348	226 64·94%	122 35·06%	..
Proston ..	17,132	8,124 47·42%	9,008 52·58%	..	..	8,651	8,369 96·74%	282 3·26%	..	831	822 98·92%	9 1·08%	..
Kingston ..	36,060	35,119 97·39%	941 2·61%	..	..	25,251	25,251 100%	..	..	3,289	3,289 100%	..	..
Woodford ..	15,180	11,981 78·93%	3,199 21·07%	..	..	5,458	5,114 93·7%	344 6·30%	..	100	100 100%	..	..
Allora	22,675	21,677 95·60%	998 4·4%	..	..	225	225 100%	..	..	17	17 100%	..	..
Inglewood ..	1,783	1,359 76·22%	424 23·78%		..	3,361	3,016 89·74%	345 10·26%	..	528	446 84·47%	82 15·53%	..
Mill Hill ..	15,373	14,062 91·47%	1,285 8·36%	26 ·17%	..	..	..	..	..	382	345 90·31%	37 9·69%	8

OFFICIAL GRADINGS IN BOXES—*continued.*

Factory.	Boxes Submitted As Choice.	Official Grading Result.				Boxes Submitted As First Quality.	Official Grading Result.			Boxes Submitted As Second Quality.	Official Grading Result.		Boxes Submitted as Pastry Quality.
		Choice.	First.	Second.	Pastry.		First.	Second.	Pastry.		Second.	Pastry.	
Texas	..	..	..	..	..	273	242 88·63%	31 11·36%	..	95	84 88·42%	11 11·58%	..
Cooroy	16,742	11,439 68·33%	5,280 31·54%	23 ·13%	..	3,530	2,976 84·31%	554 15·69%	..	132	121 91·67%	11 8·33%	..
Gympie ..	104,385	97,995 93·88%	6,390 6·12%	..	..	7,786	5,952 76·44%	1,834 23·56%	..	2,041	1,378 67·52%	663 32·48%	..

PRODUCTION, PAYMENTS, AND GRADINGS OF BUTTER IN QUEENSLAND, FOR THE YEAR ENDED 30TH JUNE, 1949—*continued.*

Factory.	Manufacture and Payments in Lb.					Over-run.		Make Graded.
		Total.	Choice.	First.	Second.	Pastry.	Actual.	Paid.	Per Cent.
Texas	Make	153,105	131,769	16,072	5,264	..	6,705	7,108	13·46
	Pay	153,508	41,682	103,305	8,521	..	4·58%	4·86%	..
Cooroy	Make	1,231,676	1,035,956	188,944	6,776	..	37,150	37,421	92·77
	Pay	1,231,947	1,149,501	82,423	23	..	3·11%	3·11%	..
Gympie	Make	6,709,223	6,154,173	444,528	110,522	..	207,065	206,582	95·32
	Pay	6,708,740	6,271,065	351,522	86,153	..	3·18%	3·18%	..

Breeds of Fowls.

P. RUMBALL, Officer in Charge, Poultry Branch.

ORIGIN OF THE DOMESTIC FOWL.

A VISIT to the poultry pavilion at any Show reveals a great number of breeds, with all their variety of type and colour, yet the many breeds exhibited at the State's largest Show represent only a small percentage of the recognised breeds of the world.

To the best of our knowledge all breeds of fowls had a common ancestor, which Darwin suggested was a species of wild jungle fowl (*Gallus bankiva*), an inhabitant of Assam, Burma, Siam and adjacent countries. Records indicate that the fowl was common in China in 1400 B.C., but it was not introduced into Australia until 1788.

How the distinctive characters of various breeds originated in early times is a matter for conjecture. There is no doubt that the evolution of the early breeds was due to the influence of natural selection, in which environment played a major part, and those unaccountable mutations or "sports" of which every poultry-breeder is aware.

With domestication, natural selection gave way to man-controlled or "artificial" selection. By retaining only those birds which showed characters that appealed to his fancy he took over Nature's work and shortened tremendously the period of time required for the creation of a new breed. Only in comparatively recent times did man realise that he possessed the power to create new breeds from existing ones and by careful breeding and selection to improve the existing ones as well. To attempt to explain in detail how all present-day breeds were evolved is entirely beyond the scope of this article, but a brief history is given when dealing with standards.

BREEDS.

It is impossible to deal with all breeds, and reference will only be made to those that are used to an appreciable extent in this State for commercial purposes.

All breeds of poultry readily adapt themselves to the climatic conditions in the coastal areas of Queensland, but, as a general principle, it can be taken that what are referred to as heavy or dual-purpose breeds and game breeds are more adversely affected by extremes of heat than those referred to as light breeds, while the light breeds appear to be more adversely affected by extremes of cold than the dual-purpose and game classes.

Extremes of heat, cold, wind and rain are not conducive to the best results with any breed, and consequently protection should be afforded all classes of poultry against these unfavourable conditions. Although dual-purpose breeds appear to be more adversely affected by heat than light breeds, it is considered that conditions of housing could be such as to permit of the successful raising of these breeds in the hottest districts of the State.

Commercial poultry may be grouped into three classes—light, heavy or dual-purpose, and game.

Light Breeds.

Light breeds are usually breeds developed extensively for egg production, with little or no attention being paid to table qualities. This class of bird may also be classed as a non-sitter. Among many strains, individuals will be found in which the broody trait has not been bred out, but taken collectively they may be classed as non-sitters. Another characteristic of the light breeds is that they are layers of white-shelled eggs.

Among this class Leghorns predominate, with probably the Ancona being the next most popular, followed by the Minorca.

Heavy or Dual-Purpose Breeds.

Breeds of this class have been developed for table and egg-producing qualities. Taken as a group they are not as efficient egg producers as the light breeds, but individuals of this class hold the record as egg producers in this State, namely 354 eggs in 365 days. Without exception, the heavy breeds are very docile, whereas light breeds are of a more or less nervous disposition. Breeds of this class may also be referred to as sitters. Every effort has been made to breed this characteristic out, and it has been done to some considerable extent by many breeders, but in the best of flocks broody hens will be found. The egg of this class should be brown in colour, although many pale eggs will be found in all breeds.

The most popular breed of this class is the Australorp. The Rhode Island Red is probably next in favour, followed by the Langshan and the Sussex.

Game Class.

This is essentially a table class, but it is not profitable to breed game fowls for this purpose. The most profitable manner in which game fowls might be utilised is for crossing purposes. The crossing of the game male with utility females brings about a marked improvement in the quality of breast meat.

Among the game class are Old English, Indian, and Australian game.

LOCATION AND NAMES OF EXTERNAL PARTS OF THE FOWL.

(With an explanation of parts and faults of the commercial breeds of Queensland. See Plate 107 for details.)

ABDOMEN.—The rear portion of the body; that portion not protected by a bony structure.

Faults.—Sagging, hard, due to excessive fat or internal disorders; distended with fluid.

BACK.—The top of the body from the neck to the base of the tail. It should be long, but varies according to the breed. It should also be wide and flat.

Faults.—Narrow; roach; or any deformity.

BEAK.—Both mandibles. The beak should be of medium length, strong, and slightly curved.

Faults.—Long; straight; short; crossed; parrot.

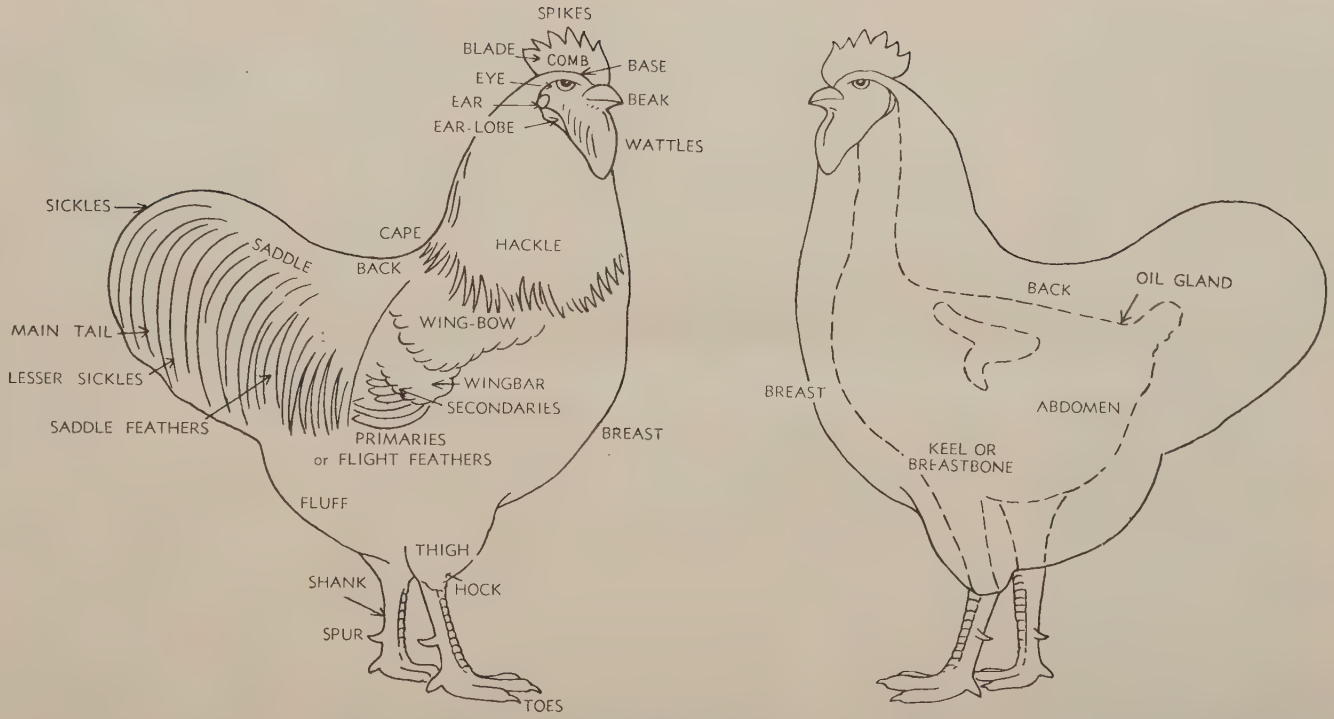


Plate 107.
PARTS OF THE FOWL.

BREAST.—From the point of the keel to the base of the neck.

Faults.—Cut away, frequently termed "lack of front"; pendulous due to the enlargement of the crop.

COMB.—A fleshy growth on top of the skull. Two types in poultry bred in this State for commercial purposes, viz., single and rose. Peacombs are found on Indian Game.

Single Comb.—Single, fleshy, serrated formation extending from the beak backward and over the head. The serrations should be deep and even, and broad between the points of the spikes. Portions of the comb are referred to as the—

Spikes—The pointed portion on the upper part of the comb.

Blade—The portion of the comb at the rear of the last spike.

Base—The portion of the comb adjoining the head.

Rosecomb.—A low, solid, fleshy mass, covered on its upper surface with small rounded points, frequently referred to as "working," terminating in a well-defined spike at the rear, known as the leader.

Faults.—Single—Lopped in males and heavy breed females; erect in light breed females, such as Leghorns; crooked; twisted; thumb marks; coarse; unevenly serrated; side sprigs.

Rosecomb.—Lopped; smooth; hollow or split centre; twisted; crooked.

EAR.—The organ of hearing, which is situated at the rear of and slightly below the eye. It is protected by a tuft of small feathers.

EAR-LOBES.—The raised skin below the ears. Should be of correct size and shape in conformity with the standard, smooth and open.

Faults.—Wrinkled; incorrect size or shape; folded; red in white lobes; white in red lobes; blistered.

EYE.—The eye should be full, round, prominent, bright, and expressive, conforming in colour to the standard of the breed.

Eyelids.—The eyelids consist of upper, lower, and a thin white nictitating membrane, which is mainly concealed.

Eye-ring.—The edges of the eyelids. In a yellow-skinned bird the yellow pigment bleaches out very rapidly from the eye-ring with production.

Faults.—Pupil misshapen; iris incorrect colour; eyes that give the appearance of being other than round; sunken eyes.

FACE.—The bare or almost featherless area between the lobes and the point of the beak. Should be free from feathers, bright red, smooth, and full.

Faults.—Excessive feathering; skin dark or white; wrinkled; sunken.

LEG.—Includes the thigh (fleshy part) and shank (scaly part).

Faults.—Bow-legged; in-kneed; malformations.

NOSTRILS.—The openings at the base of the upper mandible of the beak extending into the head.

OIL-GLAND.—Situated immediately in front of the base of the tail. Supplies oil for the bird's feathers.

SADDLE.—The rear portion of the back, extending to the tail, from which the saddle hackle or feathers grow in a male. In a female the feathers are termed the cushion.

SPUR.—The horn-like growth on the shanks of the males. A fault in females.

TOES.—There are four toes, three projecting forward and one backward. The toes should be straight, and in length proportionate to the bird.

Faults.—Crooked; enlarged joints.

WATTLES.—The pendant fleshy growths at the sides and base of the beak, conforming with the comb in size.

Faults.—Misshapen; beefy; uneven in size; any tendency to fold inwards in front.

WINGS.—The upper limbs or arms of the fowl.

Faults.—Carried unevenly or loosely, resulting in the wing being not held in proper position, termed slipwing; associated with twisted and curled flight feathers.

PLUMAGE.

CAPE.—The short feathers underneath the neck hackle coming over the shoulders, collectively shaped like a cape.

CUSHION.—The mass of feathers at the rear of the back of a hen, partly covering the tail, and corresponding to the saddle in the male.

Fault.—In most commercial breeds, looseness of cushion is a serious defect.

FLUFF.—Soft downy feathers around the thighs and the abdomen; the downy part of feathers; the small feathers between the toes of birds.

HACKLES.—The neck plumage of a fowl, or the saddle plumage of a cock, consisting of long, narrow pointed feathers.

LEG FEATHERS.—Feathers projecting from the outer side of the shanks—e.g., Langshans.

SICKLES.—The long, curved feathers of a male's tail.

TAIL.—True tail feathers are long, broad, and stiff. Tail coverts are in front of and at the side of the tail.

Faults.—In tail carriage—squirrel; low; wry.

UNDER-COLOUR.—The colour of the fluff of the feathers.

WING.—*Primaries.*—The outer flight feathers, hidden when the wing is closed.

Secondaries.—The inner flight feathers, which are on the outside when the wing is closed.

Wing-bar.—Any line of dark colour across the middle of the wing caused by the colour or marking of the feathers known as the lower wing coverts.

Wing-bay.—The triangular part of a folded wing between the wing-bar and the end of the flight feathers.

Wing-bow.—The upper or shoulder part of the wing.

Faults.—A wing so irregularly formed that it shows a decided gap between primaries and secondaries.

[TO BE CONTINUED.]

EXPORT OF POULTRY MEAT DOUBLES.

Queensland's export trade in dressed poultry more than doubled itself last year, said the Minister for Agriculture and Stock (Honourable H. H. Collins) recently.

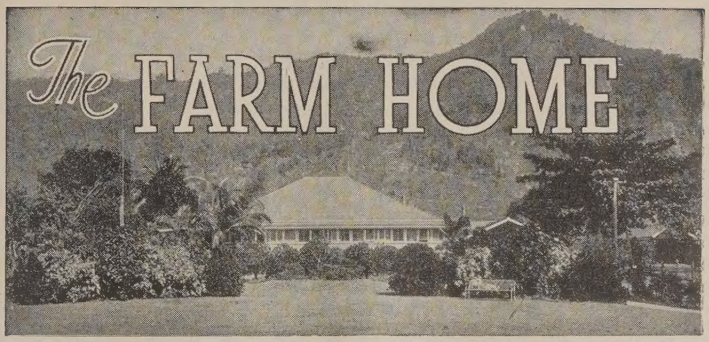
Few markets, he said, had developed so rapidly. Figures from the Poultry Branch of his Department showed that for the year ended June 30th last 3,400,320 lb. (1,518 tons) of dressed poultry of a gross value of £400,000 went overseas from Queensland, practically all to Great Britain. The previous year's figures were 1,333,527 lb. with a value of about £150,000.

Present indications were that the 1948-49 figures would be maintained, if not exceeded, in the current 12 months.

Officers of the Branch reported that the poultry exported comprised hens, young cockerels, ducks and turkeys. Before the war this export trade did not exist, and Great Britain then got most of its poultry meat requirements from European countries. The war ended this trade with Britain but gave Australia its chance of capturing the market.

However, it is expected that with the rehabilitation of Europe, Australia sooner or later would have to face competition from European countries on the British market. Therefore, the prime duty of poultry fatteners was to raise the highest quality birds for this market so that the trade can be retained.

The export trade had also aided the poultry industry in another way. Before it was developed a very large percentage of cockerel chickens was destroyed as day-old chicks, because without a paying market it was not economical to raise them. Now the market is available, these chickens are being raised for export and are giving a good return to the farmer.



Sleep and the Baby.

LIFE almost begins with sleep. It is as essential for the child's healthy development as is its mother's milk. In fact, in infancy sleep is closely related to nutrition. The baby eats to sleep and he wakes to eat, which promptly puts him again to sleep, so that the two functions almost overlap!

Sleeping Period.

Until he is a month old the average infant sleeps a total of 22 out of 24 hours. These long hours of sleep are necessary so that the nervous system may gain the opportunity to adapt itself to independent functioning. At birth the nerve sheaths are incompletely formed and some of these structures are poorly "insulated." The "insulation process" takes several months to mature. For this reason practically all infants for the first few months easily jump or startle.

As the infant grows and its nerve coverings increase in quality and amount, the periods of sleep decrease. At two months a baby usually sleeps about 20 hours out of 24. At four months he may be expected to sleep 16 to 18 hours a day, and at one year 14 to 16 hours. There are wide variations, of course, and it must be recognized that sleep is not a well defined, uniform response, but that it varies enormously with the individuality of the child and still more with its maturity. If a child sleeps less but is happy during his waking hours, one need not be concerned. If he sleeps more, but shows normal mental reactions when awake, this, too, can be passed without worry.

We must be prepared to find variations in sleep behaviour from time to time, sometimes from day to day. Such variations betray the complexity of sleep as behaviour. One is accustomed to think of sleep as a cessation of behaviour; it is, however, a positive function. It is not a mere stoppage of machinery; it is a readjustment of the whole machinery of the organism, including the central nervous system, to protect the total and remote welfare of this organism.

All sleep is, so to speak, vulnerable; how vulnerable depends upon two factors: the constitution of the child and the maturity of the child. He is especially likely to show disturbances of sleep behaviour during transitional periods of imbalance when growth changes and consequent readjustments are most actively taking place.

The young baby simply falls off to sleep; the young child walks a winding path along the precipice of wakefulness before he falls off to sleep. It is as though he had to pick his way, before he finds just the right spot for the plunge.

Wakening at Night.

There are many babies who at one year and older make it a practice to awaken in the middle of the night, crying without apparent reason. Many parents erroneously attribute this to teething. Why the teething pains abate promptly when the baby is taken into the parent's bed, as is almost invariably the case, one apparently does not stop to consider. The fact is that the awakening on the part of the child is merely an effort to obtain a little extra attention to which he is not entitled. The only way by which this bad habit may be stopped is never to give it an opoprtunity to develop. The child must be made to realize from the beginning that the comfort of others must be respected as well as his own. A good practice to follow when the baby first awakens during the night is to investigate the cause. If he is thirsty, he should be given water. If he is wet, he should be changed; and when his needs have been attended to he should be tucked in without comment and left alone. A respectable baby knows his limitations in crying. He stops only when he learns that it does not bring results.

Going to Sleep.

The mother's training of a child in sleep should be insistent and carried out with assurance. It should aim at accustoming him to settle easily in bed, in darkness, although not necessarily in complete quiet.

Some children develop elaborate pre-sleep rituals which seem to aid the process of release into sleep and which should not be unduly interfered with. For instance, the child takes one or two favourite toys to bed with him: he talks and sings to himself: he may even indulge in a brief work-out wrestle with his bedclothes. These seem to be relaxational expedients.

More extreme deviations also occur, as rocking on hands and knees, bed shaking, head banging and head rolling. However annoying they may be, it is apparent that they are but variants and exaggerations of normal methods of sleep release. Removal of the physical restraint of a sleeping bag and postponement of bed time to increase fatigue are helpful measures. If the deviation persists beyond the second year, a shift from the accustomed cot to a new bed may bring about a dramatic termination.

Sleeplessness.

Failure to settle or sleep may, however, be a symptom of various physical or nervous disorders and it may be necessary to enlist the aid of a doctor to help the mother distinguish between disturbances due to physical ailments and those due to "playing up" on the part of the child. Of simple physical causes, general health, nutrition, teething troubles, feverishness and worms and obstructed air passages are the most common. Disturbed sleep may also have an emotional or environmental basis—as change of scene, undue excitement, feelings of insecurity caused maybe by family dissension or illness, and fears due to any cause. Restless sleep, talking and nightmares are only significant if there is other evidence of illness or anxiety.

Any further information on this and other matters connected with children may be obtained by communicating personally with the Maternal and Child Welfare Information Bureau, 184 St. Paul's Terrace, Brisbane, or by addressing letters "Baby Clinic, Brisbane." These letters need not be stamped.

ASTRONOMICAL DATA FOR QUEENSLAND.

DECEMBER, 1949.

By W. J. Newell, Hon. Secretary of The Astronomical Society of Queensland.

TIMES OF SUNRISE AND SUNSET.

At Brisbane.			MINUTES LATER THAN BRISBANE AT OTHER PLACES.					
Day.	Rise.	Set.	Place.	Rise.	Set.	Place.	Rise.	Set.
	a.m.	p.m.						
1	4.45	6.28	Cairns	51	7	Longreach	44	26
6	4.46	6.32	Charleville ..	30	24	Quilpie	33	37
11	4.47	6.36	Cloncurry	65	34	Rockhampton ..	19	1
16	4.49	6.38	Cunnamulla ..	27	32	Roma	19	15
21	4.51	6.41	Dirranbandi ..	16	22	Townsville ..	42	8
26	4.54	6.43	Emerald	28	11	Winton	52	29
31	4.56	6.46	Hughenden ..	49	21	Warwick	2	6

TIMES OF MOONRISE AND MOONSET.

At Brisbane.

Day.	Rise.	Set.
	p.m.	a.m.
1	2.39	1.50
2	3.32	2.18
3	4.27	2.47
4	5.23	3.20
5	6.21	3.58
6	7.20	4.42
7	8.16	5.32
8	9.08	6.28
9	9.55	7.29
10	10.36	8.31
11	11.13	9.34
12	11.47	10.37
13	..	11.38
	a.m.	p.m.
14	12.20	12.41
15	12.53	1.45
16	1.28	2.51
17	2.06	4·00
18	2.51	5.11
19	3.42	6.20
20	4.40	7.25
21	5.44	8.22
22	6.50	9.10
23	7.54	9.51
24	8.55	10.26
25	9.53	10.56
26	10.47	11.24
27	11.39	11.51
	p.m.	a.m.
28	12.31	..
29	1.23	12·18
30	2.17	12.47
31	3.13	1.18

MINUTES LATER THAN BRISBANE (SOUTHERN DISTRICTS).

Charleville 27; Cunnamulla 29; Dirranbandi 19;
Quilpie 35; Roma 17; Warwick 4.

MINUTES LATER THAN BRISBANE (CENTRAL DISTRICTS).

Day.	Emerald.		Longreach.		Rockhampton		Winton.	
	Rise.	Set.	Rise.	Set.	Rise.	Set.	Rise.	Set.
1	16	21	31	37	7	12	36	43
6	9	30	25	45	0	21	26	53
11	14	26	29	42	4	17	33	49
16	23	14	39	29	14	4	45	33
21	30	9	46	23	21	0	54	26
26	21	18	38	34	12	9	43	38
31	12	26	27	42	2	18	30	50

MINUTES LATER THAN BRISBANE (NORTHERN DISTRICTS).

Day.	Cairns.		Cloncurry.		Hughenden.		Townsville.	
	Rise.	Set.	Rise.	Set.	Rise.	Set.	Rise.	Set.
1	22	33	45	54	30	38	19	29
3	13	43	39	59	24	45	12	36
5	5	51	35	64	19	50	5	43
7	2	56	33	67	17	53	3	46
9	7	53	36	66	20	51	7	44
11	16	45	41	60	26	46	14	37
13	27	33	49	54	33	38	23	29
15	33	22	53	45	38	30	28	19
17	45	9	61	36	46	22	37	9
19	55	2	68	32	51	17	45	3
21	56	2	68	32	52	17	46	3
23	50	11	64	38	48	23	41	11
25	39	22	56	45	41	30	33	19
27	29	31	50	52	35	37	25	27
29	19	37	42	56	27	41	17	32
31	10	46	37	61	22	47	9	38

Phases of the Moon.—Full Moon, 6th December, 1.13 a.m.; Last Quarter, 13th December, 11.48 a.m.; New Moon, 20th December, 4.55 a.m.; First Quarter, 27th December, 4.31 p.m.

On 22nd December the Sun will reach its maximum angle south of the Equator and from Northern Queensland will rise and set 25 degrees south of true east and true west respectively and as viewed from Southern Queensland, 28 degrees south of true east and true west.

On 14th and 27th December the Moon will rise and set approximately at true east and true west respectively.

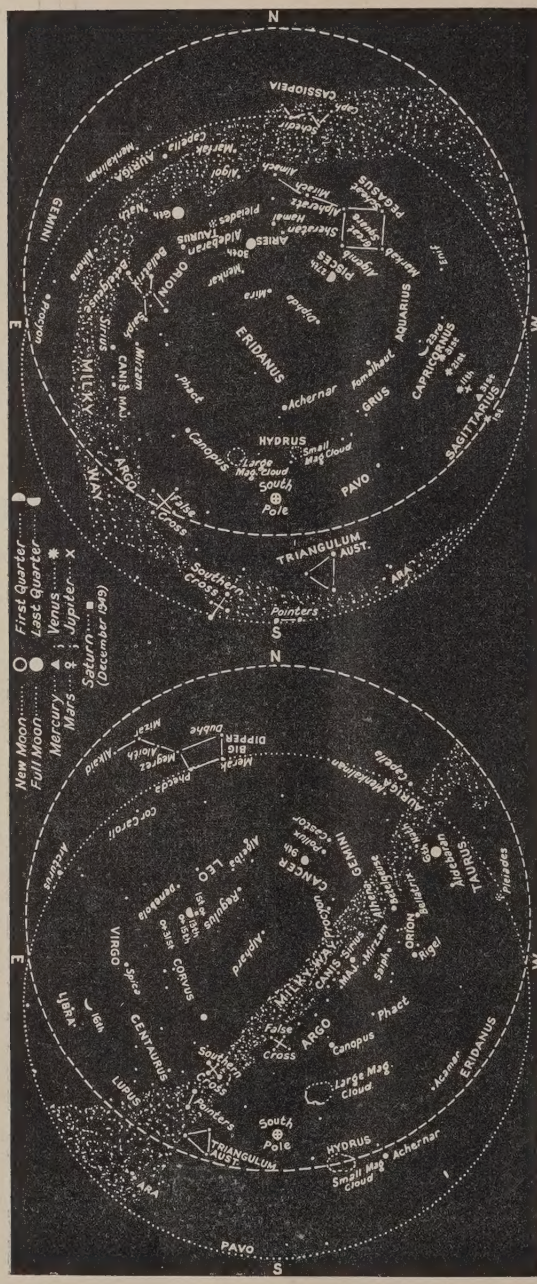
Mercury.—At the beginning of December, in the constellation of Cancer, will set 26 minutes after the Sun and will remain an evening planet all this month, setting on the 31st 1 hour and 20 minutes after the Sun.

Venus.—In the constellation of Capricornus, will set 3½ hours after the Sun at the beginning of the month and on the 7th will pass 2 degrees south of Jupiter, while on the 26th it will attain greatest brilliancy. At the end of the month it will set about 2½ hours after the Sun.

Mars.—Rising an hour or so after midnight, in the constellation of Leo, at the beginning of December. It will rise about midnight in the constellation of Virgo at the end of the month.

Jupiter.—Now fast moving out of the evening sky it will set between 10 p.m. and 11.15 p.m. at the beginning of the month but will set only 1¾ hours after the Sun at the end of the month.

Saturn.—Rising at the same time as Mars, at the beginning of the month, it will remain in Leo throughout the month and on the 31st will rise between 10.45 p.m. and midnight.


New Moon
Full Moon
First Quarter
Last Quarter
Mercury
Venus
Mars
Jupiter
Saturn
(December 1949)
N
S
E
W
MILKY WAY
ERIDANUS
AQUARIUS
PEGASUS
PISCES
ARIES
TAURUS
ORION
GEMINI
CASSIOPEIA
CAPRICORNUS
SAGITTARIUS
GRUS
PAVO
HYDRUS
TRIANGULUM AUST.
ARA
ARGO
CANIS MAJ.
CANIS MIN.
Achernar
Canopus
Sirius
Rigel
Procyon
Betelgeux
Aldebaran
Pleiades
Hamal
Alpheratz
Markab
Algenib
Fomalhaut
Altair
Deneb
Vega
Antares
Spica
Regulus
Pollux
Castor
Capella
Alioth
Mizar
Dubhe
Pointers
Southern Cross
False Cross
South Pole
Large Mag. Cloud
Small Mag. Cloud
CANCER
LEO
VIRGO
CORVUS
CENTAURUS
LUPUS
LIBRA
CORONA BOR.
HERCULES
OPHIUCHUS
SCORPIUS
BOOTES
URSA MAJOR
DRACO
CEPHEUS
LYRA
AURIGA
PERSEUS
ANDROMEDA
CETUS
ERIDANUS
HYDRUS
PAVO
TRIANGULUM AUST.
ARA
LUPUS
CENTAURUS
CORONA AUSTR.
SCORPIUS
SAGITTARIUS
CAPRICORNUS
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PISCES
ARIES
TAURUS
ORION
GEMINI
CANCER
LEO
VIRGO
LIBRA
BOOTES
HERCULES
LYRA
CYGNUS
AQUILA
SERPENS
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SCORPIUS
SAGITTARIUS
CAPRICORNUS
AQUARIUS
PEGASUS
PISCES
ANDROMEDA
CASSIOPEIA
CEPHEUS
DRACO
URSA MAJOR
LYNX
CANIS MIN.
MONOCEROS
HYDRA
CRATER
CORVUS
COMA BER.
CANES VEN.
LEO MINOR
PERSEUS
AURIGA
TRIANGULUM
ARIES
CETUS
ERIDANUS
FORNAX
PHOENIX
GRUS
PAVO
INDUS
TUCANA
HYDRUS
OCTANS
CHAMAELEON
VOLANS
CARINA
VELA
PUPPIS
PYXIS
ANTLIA
HYDRA
CRATER
CORVUS
CENTAURUS
LUPUS
LIBRA
CORONA AUSTR.
SCORPIUS
ARA
TRIANGULUM AUST.